

THE MERRIMACK: DESIGNS FOR A CLEAN RIVER PLAN OF STUDY



JANUARY 1973

PLAN OF STUDY
FOR THE
WASTEWATER MANAGEMENT PROGRAM
IN THE
MERRIMACK RIVER BASIN
MASSACHUSETTS

BY

COMMONWEALTH OF MASSACHUSETTS

AND

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

AND

CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION

MASSACHUSETTS AREA PLANNING COUNCIL

MERRIMACK VALLEY PLANNING COMMISSION

MONTACHUSETT REGIONAL PLANNING COMMISSION

NORTHERN MIDDLESEX AREA COMMISSION

2 JANUARY 1973

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- C. Cost Estimates

ANNEX FIGURES

1. Study Task Assignments
2. Study Schedule
3. Cost Estimates

I. BASIC PLANNING CONSIDERATIONS.

A. The Study Area

The Merrimack River basin lies in central New England (Plate 1) and extends from the White Mountain region of New Hampshire southward into the east central portion of Massachusetts. It is bounded by the Connecticut River basin on the west and northwest, the Saco and Piscataqua River basins on the northeast and east, the Charles River on the east and southeast, and the Blackstone River basin and the Narragansett Bay drainage basin on the south. The Merrimack River basin, the fourth largest of those lying wholly in New England, has a maximum length in a north-south direction of approximately 134 miles, and a maximum width in an east-west direction of 68 miles. It has an area of 5,010 square miles, of which 3,800 square miles are in New Hampshire and 1,210 square miles are in Massachusetts. The 1970 population of the basin consists of approximately 400,000 people in New Hampshire and 850,000 in Massachusetts.

The Merrimack River basin within Massachusetts (Plate 2) is approximately 60 miles wide at its widest section in an east-west direction, and is about 30 miles wide in a north-south orientation. The 50-mile long main stem of the Merrimack River in Massachusetts, extending from the Newburyport Light to the Massachusetts/New Hampshire state line, flows generally in an easterly direction. The lower 22 miles of the river are subject to tidal action from the Atlantic Ocean.

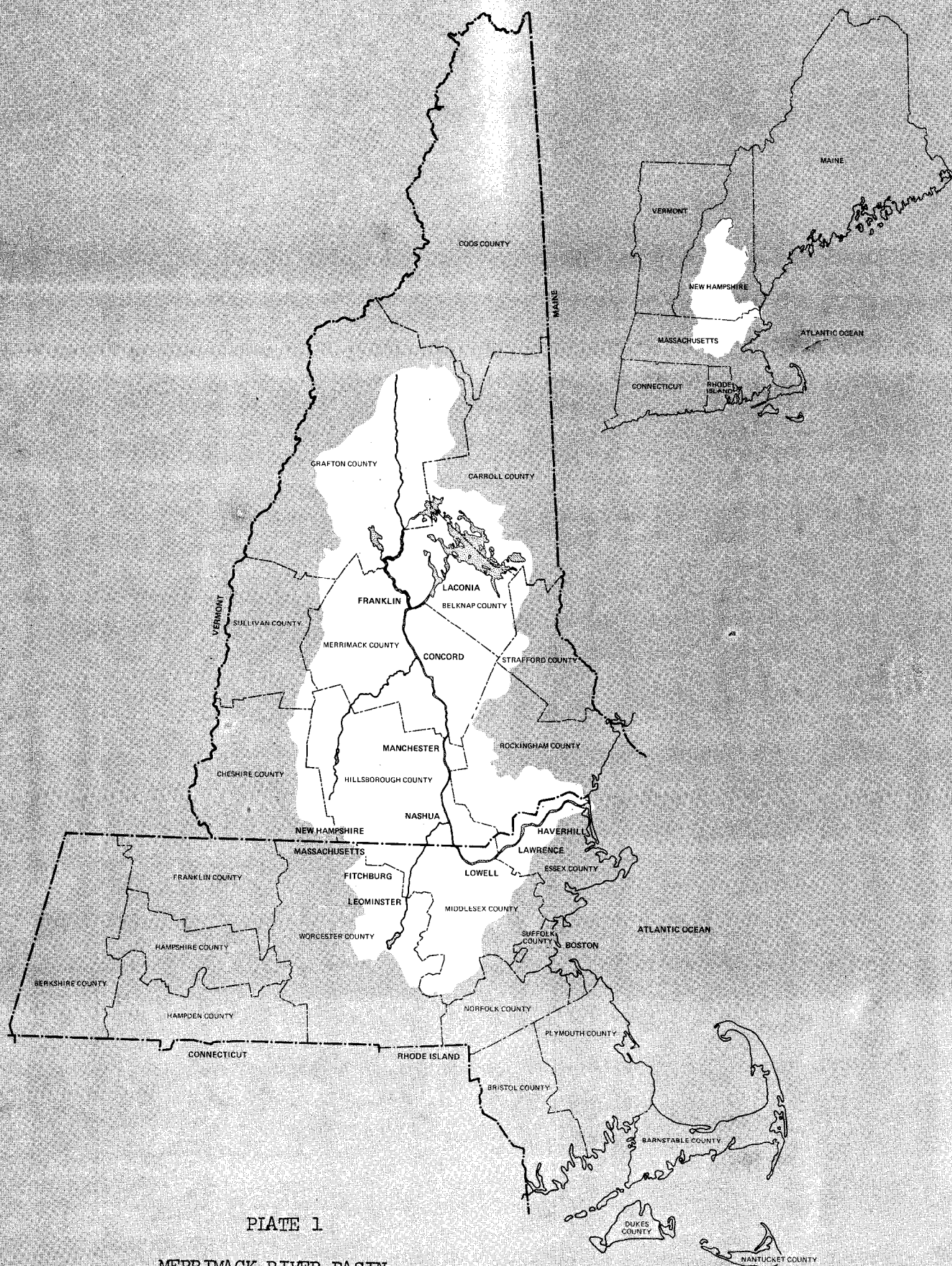
Presently, the Merrimack River is polluted by daily discharge of approximately 128 million gallons of raw and partially treated

municipal, industrial and storm wastewaters into the river itself or its Nashua tributary. This discharge of wastes has altered the physical, biological and chemical characteristics of the river since before the turn of the century, and will become progressively worse unless effective corrective actions are taken. (It is noted that some constructive action has been taken by local, State and Federal agencies to alleviate the pollution problem in the river). The polluted condition of the river has serious impacts upon the ecologic, aesthetic, hygienic, social and economic aspects of the entire river basin and its inhabitants.

B. Background of the Study

The Corps of Engineers, in response to directives from the Congress of the United States and the President's Office of Management and Budget, undertook in the spring of 1971 a Pilot Wastewater Management Program. This Program commenced with feasibility studies in five urban areas across the country; San Francisco Bay, Chicago, Detroit, Cleveland and the Merrimack River basin. The feasibility studies culminated with reports in September 1971.

The Corps of Engineers Wastewater Management Program for the Merrimack River basin resulted in a report titled "The Merrimack; Designs for a Clean River" dated September 1971. This report set forth alternative strategies for managing municipal, industrial and storm wastewater. These strategies utilized waste treatment plants, land treatment techniques and combinations of these two methods.



PIATE 1

MERRIMACK RIVER BASIN

- NORTHERN MIDDLESEX AREA COMMISSION
- MERRIMACK VALLEY PLANNING COMMISSION
- METROPOLITAN AREA PLANNING COUNCIL
- UNASSIGNED
- CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION
- MONTAGUSETTS REGIONAL PLANNING COMMISSION
- NASHUA RIVER BASIN OUTLINE
- M O C STUDY LIMITS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS
WASTEWATER MANAGEMENT
STUDY AREAS

SCALE:
0 5mi 10mi

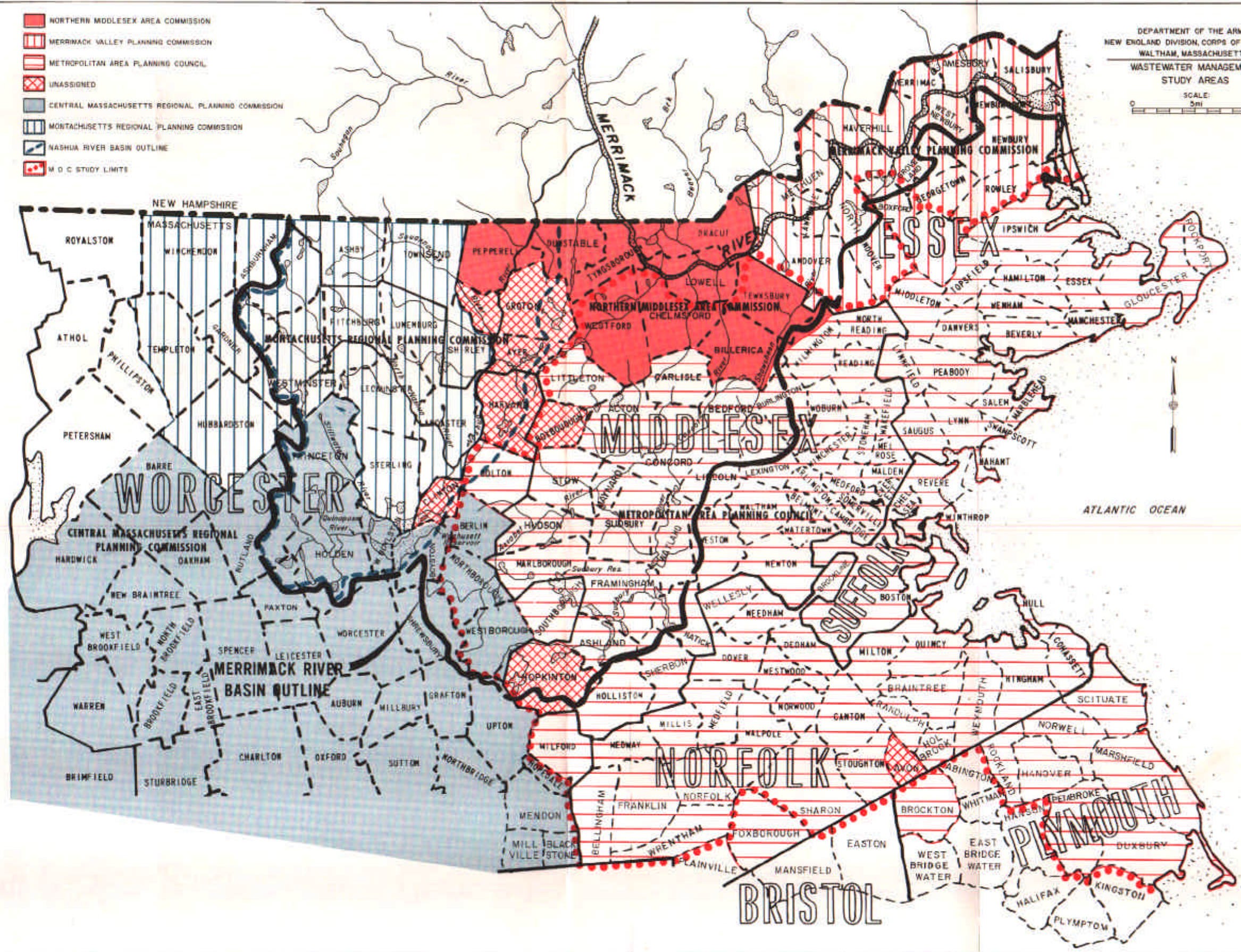


Plate 2 - The Study Area

On 2 March 1972 the Committee on Public Works of the United States Senate passed a resolution directing the Corps of Engineers to proceed with a survey-scope study in the Massachusetts portion of the Merrimack River basin, in cooperation with the Commonwealth of Massachusetts and the Environmental Protection Agency (Attachment 1). On 14 June 1972 the Public Works Committee of the U.S. House of Representatives also directed the Corps of Engineers to proceed with a survey-scope study for that portion of the Merrimack River basin within Massachusetts in cooperation with the Commonwealth of Massachusetts and the Environmental Protection Agency (Attachment 2).

II. SUMMARY OF THE PLAN OF STUDY.

This plan of study sets out the procedures to be followed in developing a comprehensive wastewater management plan for the Merrimack River basin to meet all foreseeable short and long term needs. It is to be used as a management tool to assist in orientation, direction, and coordination, as well as to show the interrelationships and missions between the participants within the study. It is intended that it be flexible; undergoing periodic modification as required.

The study will be accomplished as a joint effort by the Commonwealth of Massachusetts*, Environmental Protection Agency, the Regional Planning Agencies, and the Corps of Engineers. The study will take between twelve and eighteen months.

In preparing the report the Corps of Engineers and others will be operating under the authority of resolutions from the Public Works Committees of the U.S. Senate and House of Representatives, dated March 2, 1972 and June 14, 1972, respectively. It is noted that the resolutions also authorize a wastewater management study for the Boston Metropolitan area (Boston-Eastern Massachusetts Wastewater Management Study). In view of the difference in wastewater problems between the Merrimack River basin and the Boston Metropolitan area, it has been determined that separate survey studies shall be prepared for each area. Therefore, the Boston Metropolitan area study will be prepared and produced as a separate report from the Merrimack River basin report.

*Hereafter the Commonwealth of Massachusetts refers to the various agencies of the Commonwealth and the various Regional Planning Agencies in the study area.

III. SCOPE AND GUIDELINES OF THE STUDY.

This chapter of the Plan of Study states the (A) guidelines and (B) program philosophy under which the study effort will be conducted.

The legislative guidelines and program philosophy will help in formulating the study goal with respect to the needs and desires of the people involved. See Section 2.0 for development of the study goal.

A. Guidelines

The guidelines for the study effort will determine the extent and scope of planning. The guidelines are based upon the following planning documents: Sections 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register adopted 2 July 1970, the Water Resources Council Proposed Principles and Standards for Planning Water and Related Land Resources (Part II) and the Federal Water Pollution Control Act Amendment of 1972 (passed 28 September 1972).

B. Program Philosophy

The program philosophy is consistent with the previously stated guidelines.

The philosophy of the wastewater management program has three basic points: (1) wastewater and its constituents have significant reuse potential, (2) new and advanced waste treatment systems must be employed to bring this potential into being, and (3) wastewater management can provide an effective tool for planning future regional growth and development.

Traditionally, water pollution abatement systems have operated under the rationale that wastewater and its constituents contain little economic value, and should be discarded in an expedient manner. The reuse concept reverses this traditional thought and recognizes wastewater

and its constituents as resources out of place, as assets that can be effectively utilized rather than haphazardly discarded.

New and advanced technologies of wastewater treatment must be implemented to achieve the necessary level of effluent quality. These technologies range from the older land application technique to the sophisticated advanced waste treatment processes. Whether used singly or in combination, any proposed treatment strategies must provide effective regional wastewater treatment.

Wastewater management will impact both directly and indirectly on many elements of society. Wastewater strategies must provide a means of effective pollution abatement. The implications of these strategies with respect to problems of the people - employment, taxes, recreational opportunities, better public utilities - must be understood. Wastewater management provides one means for planning rational growth and development, and also provides a tool for constructing a more enjoyable environment in which to live and work.

IV. ORGANIZATION OF THE STUDY.

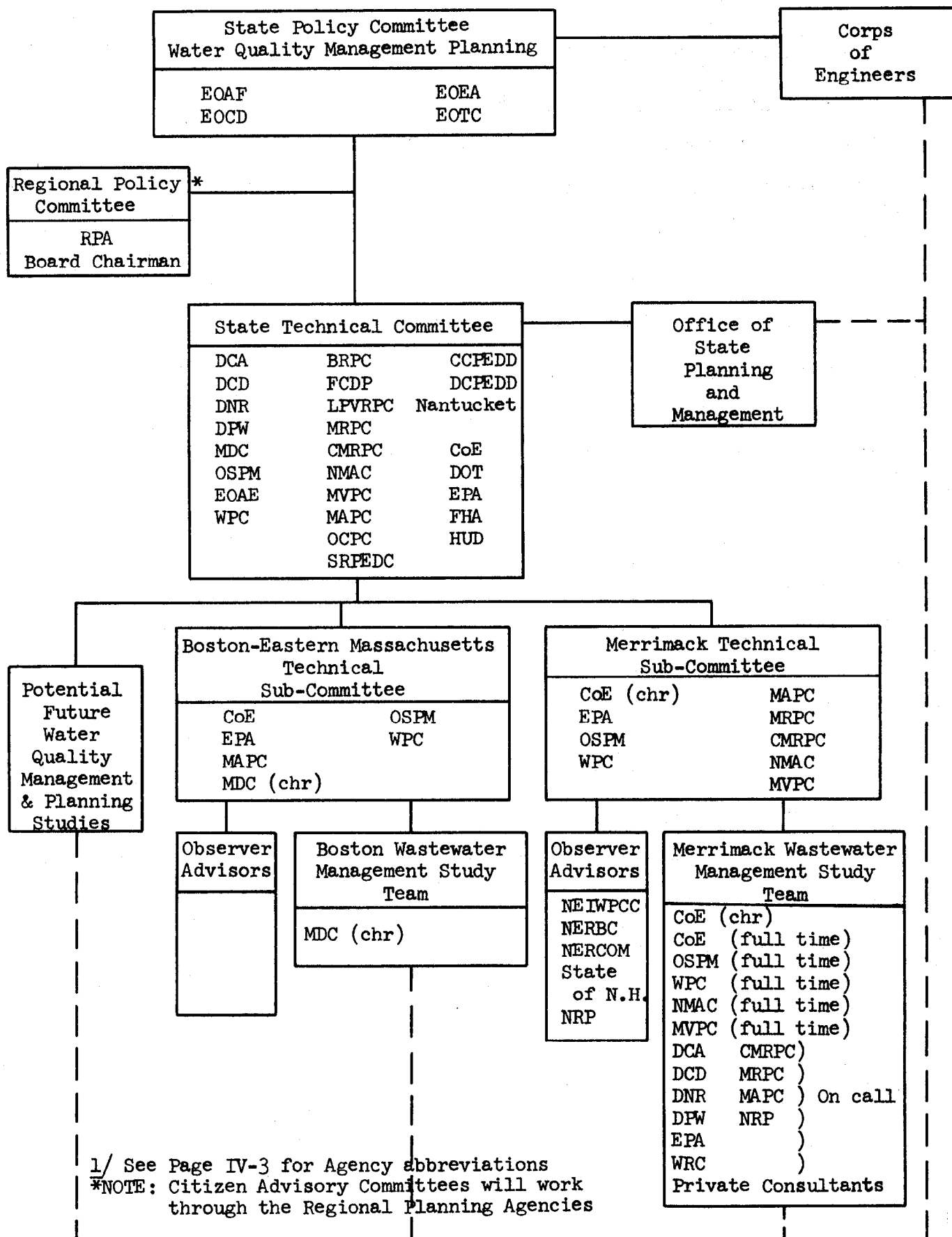
A. Objective of the Organizational Structure

The objective of the study's organizational structure is to facilitate a sound and orderly process leading to plan selection. To accomplish this objective there are specific requirements which include:

1. Incorporate the committed portions of the pollution abatement program of the Commonwealth of Massachusetts and the Environmental Protection Agency;
2. Adhere to the guidelines set forth by the EPA in "Guidelines for Water Quality Management", as required by Section 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register, adopted 2 July 1970;
3. Ensure that effective coordination and flow of information is achieved among resource disciplines as well as Federal, State, regional and local resource planners;
4. Ensure citizen and scientific involvement in the planning process;
5. Ensure that plan development is carried out in an effective, efficient, and timely manner.

The organizational structure emphasizes close inter-disciplinary coordination at the working level. The major organizational units presented in Figure 1 are defined in the following paragraphs. This organizational pattern should be considered a flexible guide, and can be modified as the needs of the planning effort become more firmly established.

INITIAL ORGANIZATION CHART^{1/} - APPROVED



AGENCY ABBREVIATIONS
(For Figure 1)

<u>Abbreviation</u>	<u>Agency</u>
BRPC	Berkshire Regional Planning Commission
CCPEDD	Cape Cod Planning and Economic Development District
CMRPC	Central Massachusetts Regional Planning Commission
CoE	Federal, Corps of Engineers
DCA	State, Dept. of Community Affairs
DCD	State, Dept. of Commerce & Development
DCPEDD	Dukes County Planning and Economic Development District
DNR	State, Dept. of Natural Resources
DOT	Federal, Dept. of Transportation
DPW	State, Dept. of Public Works
EOAF	State, Executive Office of Administration & Finance
EOCD	State, Executive Office of Communities & Development
EOEA	State, Executive Office of Environmental Affairs
EOTC	State, Executive Office of Transportation & Construction
EPA	Federal, Environmental Protection Agency
FCDP	Franklin County Department of Planning
FHA	Federal, Farmers Home Administration
HUD	Federal, Housing and Urban Development
LPVRPC	Lower Pioneer Valley Regional Planning Commission
MAPC	Metropolitan Area Planning Council

AGENCY ABBREVIATIONS (Continued)

MDC	Metropolitan District Commission
MRPC	Montachusett Regional Planning Commission
MVPC	Merrimack Valley Planning Commission
Nantucket	Town of Nantucket
NEIWPCC	New England Interstate Water Pollution Control Commission
NERBC	New England River Basins Commission
NERCOM	New England Regional Commission
NMAC	Northern Middlesex Area Commission
NRP	Nashua River Program
OCPC	Old Colony Planning Council
OSPM	State, Office of State Planning & Management
SRPEDC	Southeastern Regional Planning and Economic Development Commission
WPC	State, Water Pollution Control

B. State Policy Committee

This committee reports to the Governor of the Commonwealth of Massachusetts and is composed of the Secretaries of the Executive Offices of Administration and Finance, Environmental Affairs, Communities and Development, and Transportation and Construction.

This committee will oversee, at the State level, all of the work and determine policy on questions raised during the development of the work program. The policy committee will meet, at appropriate times, with the Regional Advisory Policy Committee to discuss regional public policy issues. The policy committee will also meet with the individual Regional Planning Agency Chairman to discuss unique regional policy issues.

The State Policy Committee and the Corps of Engineers will function together as the general policy-making body for the conduct of the Merrimack River Basin Wastewater Management Study.

C. Corps of Engineers

The Corps' portion of the Merrimack Wastewater Management (MWWM) Study is conducted under the authority of the Northeastern United States Water Supply (NEWS) Study and in accordance with the agreement between the Department of the Army, Corps of Engineers and the Commonwealth of Massachusetts (Attachment No. 3).

North Atlantic Division, Corps of Engineers, has primary responsibility for the NEWS study. However, they have designated the New England Division as the lead agency in accomplishing the technical planning effort of the MWWM study.

The Corps, in conjunction with the State Policy Committee, will develop policy and objectives for the study, as well as resolve problems which cannot be handled at the lower units of the MWM organizational structure.

D. Regional Policy Committee

This committee will consist of the Chairmen of the Regional Planning Agency boards. They will meet to discuss common regional policy issues and further articulate these issues to the State Policy Committee.

The Regional Planning Agencies represent all of the citizens in their region, including representatives from the industrial sector, academic institutions and civic organizations. They will address the citizens' opinions and recommendations in the Regional Policy Committee's discussions of policy issues.

E. State Technical Committee

Under the guidance of the State Policy Committee and utilizing the Office of State Planning and Management as its staff, this inter-agency technical coordinating committee will direct water quality management planning activities.

All agencies designated on the organizational chart (Figure 1) are permanent members of the committee. Their participation at committee meetings will vary according to their appropriate interest in various planning activities.

F. Merrimack Technical Sub-Committee

The agencies represented on this sub-committee have permanent representation on the State Technical Committee which directs all State

water quality management planning activities. As members of the sub-committee, they will be responsible for the overall direction and selection of a recommended wastewater management plan for the Merrimack River basin. They will answer major questions concerning planning methodology, and interagency working relationships as they relate to the Merrimack Wastewater Management study.

G. Merrimack Wastewater Management Study Team

This team will provide the continuing nucleus for coordination and technical efforts on the development of the wastewater management alternatives.

The day-to-day determinations and decisions will be made by the study team subject to the review of Corps of Engineers and the Commonwealth of Massachusetts. Most questions concerning the MWWM operation must first be addressed by the study team for resolution. Major questions which cannot be resolved by the team will be referred to the Technical Sub-Committee and, if necessary, to the State Technical Committee and finally to the State Policy Committee.

The study team will normally perform its function and be headquartered at the office of the U.S. Army, Corps of Engineers, New England Division, Waltham, Massachusetts. The major planning effort will be the responsibility of the Corps of Engineers, the Commonwealth's Division of Water Pollution Control, the Office of State Planning and Management, the Northern Middlesex Area Commission, the Merrimack Valley Planning Commission, the Montachusett Regional Planning Commission, the Metropolitan Area Planning Council, and the Central Massachusetts Regional Planning Commission.

Appropriate State and Federal agencies will supplement collection of basic technical information. The Management Study Team shall also negotiate contracts with outside expertise when necessary to supplement technical input and/or when there is an excessive workload.

H. Observer/Advisors

Representatives serving as observer/advisors will advise the Merrimack Wastewater Management Study Team on issues raised during the planning process that relate to their current State-Federal programs.

I. Citizens Advisory Committee

The Citizens Advisory Committee will encourage citizen participation through the public participation program, and present the citizen's opinion and recommendations to the study team.

This committee shall consist of representatives from the industrial sector, academic institutions and civic organizations. It is recommended that insofar as possible, the organizations represented be from within the study area.

Public involvement in plan development will be sought through an open planning process. Guidelines for this process are contained in "Open Planning/The Merrimack", September 1971, a report prepared for the Corps of Engineers by the New England Natural Resources Center.

V. OVERALL WORK PROGRAM

0.0 Formulation of the Detailed Plan of Study

The 0.0 activity is the development of an overall work program for the Merrimack Wastewater Management Study. The result of the initial phase of the 0.0 activity is this Plan of Study which incorporates the ideas and recommendations of the Merrimack Technical Sub-Committee. This plan is intended to be a "living" document to be revised and updated as needed during the planning process.

Considerations for the 0.0 activity include:

- a. Statement of the Problem.
- b. Definition of Guidelines and Criteria under which the Study will be Conducted.
- c. Development of Organization, Management and Working Relationship between Agencies accomplishing the Study.
- d. Development of Work Items.
- e. Estimation of Division of Effort by Major Work Items.
- f. Detail of the Cost of the Work Items.
- g. Policy Evaluation of the Need for Theoretical Models.

For more information on the procedures followed during the 0.0 activity, see Attachment 4 - Formulation of the Detailed Plan of Study.

The completed plan of study will be distributed to the appropriate State and Federal agencies for review to ensure effective and efficient plan development. It will be distributed to appropriate civic organizations and industrial and academic representatives to ensure citizen involvement in the planning process. It will also be

reviewed by representatives of the technical sector to ensure adequate scientific involvement.

OUTLINE FOR SECTION 1.0

1.0 Public Information, Community Relations and Citizens Participation

- 1.1 Develop a Public Participation Program
- 1.2 Arrange for and Conduct Public Meetings
- 1.3 Produce and Disseminate Brochures and News Letters
- 1.4 Plan and Conduct Workshops and Seminars

1.0 Public Information, Community Relations and Citizens Participation

1.1 Develop a Public Participation Program

Throughout the study the public will be encouraged to assist in the formulation and selection of alternative wastewater management plans. Since the open planning process is an integral part of this study, the guidelines for initiating and conducting such public communication program as presented in the New England Natural Resources Center's report "Open Planning/The Merrimack" dated September 1971, will be followed where applicable. This report designates an open planning process which should stimulate substantial public involvement and participation in the Merrimack Wastewater Management Study. The Regional Planning Agencies involved will be designated to take a large role in the development and conduct of this program. This program will essentially entail three parts; public meetings, workshops and public information. The Regional Planning Agencies (RPA) have evolved their own procedures for communicating with the public and these will be used to their fullest extent.

1.2 Arrange for and Conduct Public Meetings

During the course of this Wastewater Management Study, there will be at least three basin-wide public meetings where the public can officially participate and express their views concerning any alternative. These meetings will be held in the major population centers and in any other areas that may be affected by any wastewater management plan. In conducting these meetings, progress made by the study team will be presented in a concise and informative manner. At the conclusion of

the presentations the meeting will be opened to public discussion and the study team will answer any questions that the public might have. The concerned Regional Planning Agencies will utilize the powers of their offices to encourage attendance by the public and town officials. It is desired that these meetings will be a two way street; the study team will inform the public, and the public will inform the study team of their views.

In addition to the basin-wide public meetings, the Regional Planning Agencies will hold meetings in their respective areas to discuss the issues that are directly related to their particular region. The study team will assist in conducting these meetings as in the basin-wide meetings.

1.3 Produce and Disseminate Brochures and News Letters

In order to inform the public, it will be necessary to disseminate informational material. A brochure which explains the study objectives as seen by the study team will be prepared. Periodically news letters will be prepared to explain the progress of the study. News letters would be sent to all public officials and interested citizens whose names come to the attention of the study team. The public information program will also be coordinated with the news media.

1.4 Plan and Conduct Workshops and Seminars

In developing citizen involvement, it is foreseen that a series of workshops and seminars would be useful in getting to the grass-roots. These (ideally) would be small and conducted in many locations, so that they develop into discussion sessions where a citizen

with a question may come and have the answer explained to him. In addition there would be public speakers where members of the study team would go to citizen groups to give presentations on the progress of the study.

OUTLINE FOR SECTION 2.0

2.0 Development of Goal & Objectives

2.1 Statement of the Problem

2.2 Development of a Water Quality Goal and Planning Objectives

2.0 Development of Goal and Objectives

2.1 Statement of the Problem

In order to develop the study goal and objectives, it is necessary to establish a statement of the problem. This statement must identify problems associated with the existing water quality, as well as projected water quality without an implemented wastewater management plan.

2.2 Development of a Water Quality Goal and Planning Objectives

The water quality goal will be developed early in the study, and will encompass and be consistent with the needs and desires of the people such as:

1. Preservation of an adequate water supply through such means as clean water recharge of groundwater supplies.
2. Safety from potential health hazards generated by polluted waters.
3. Economic development by meeting industries' water quality needs, restoring the fishing industry, and increasing land values.
4. Recreation benefits through restoration of surface waters to the highest feasible purity.
5. Enhanced social and cultural environments through aesthetic revitalization of the riverfront.

Goals serve as the basis for actual plan formulation, evaluation, and design of wastewater systems. These goals must be consistent with the regional and state planning goals and the current Federal legislation. The implications of "zero-discharge" or "maximum feasible

purity" of effluents will be analyzed. Precise planning objectives must be identified to effectively plan for and measure the performance of wastewater systems. Identification and ranking of planning objectives provides a basis for evaluating the impacts and performance of alternative systems.

OUTLINE FOR SECTION 3.0

3.0 The Study Area Today

3.1 Inventory of Present Land Use in the Basin by Major Hydro-
logic, Minor Civil Divisions and Regions

3.2 Climatic Dimensions

3.3 Geology

3.4 Hydrology

3.5 Biota

Fresh Water and Marine (Estuary)

Terrestrial

3.6 Demographic and Economic Activity

3.61 Indicators of Growth

Population

Personal Income

Per Capita Income

Employment by Industry

Economic Production per Employee

Earnings of Persons Engaged in Production

3.62 Impacted Industries Studies

3.7 Inventory of Present Water Use, Waste Loads and Water Quality

3.71 Water Use Inventory

3.72 Existing Water Quality Data

3.8 Inventory of Present and Planned Water Quality Management
Projects and Status

3.0 The Study Area Today

3.1 Inventory of Present Land Use in the Basin by Major Hydro- logic, Minor Civil Divisions and Regions

An inventory of present land use shall be based on the latest available data including aerial photographic interpretations. The inventory will be made utilizing the following land use categories.

Agricultural or Open Land

Forested Land

Mining, Rock, or Waste Disposal Sites

Outdoor Recreational Areas

Urban Land

Wetlands

3.2 Climatic Dimensions

Basic climatic data inventory will be made from published U.S. Weather Bureau reports. Data compiled for representative stations within the basin will include mean monthly and annual temperature and precipitation, extremes of temperature and precipitation, and amounts of snowfall.

The basic climatic data described above, together with soil moisture data obtained from the Soil Conservation Service will be extrapolated to furnish evaporation and transpiration rates. These data will in turn serve as the basis for our computing the "water balance" (after Thornthwaite) for various sub-areas in the basin. The water balance will graphically illustrate monthly variation in soil moisture. This information should prove valuable in calculating amounts and duration of land application of effluent.

3.3 Geology

A geologic map of the bedrock at sites chosen for use (land disposal, construction of treatment plants, and transmission pipelines) will be compiled from existing data. If necessary, some field work will be done to fill the gaps in existing knowledge. The type of bedrock and its chemical/mineralogical characteristics will be studied. The rocks' porosity and permeability will be estimated. Information regarding the possibility of earthquakes and any potential resulting damage will be gathered from the U.S. Geological Survey (USGS) and other agencies such as the Weston Seismological Center. Where construction and excavation to bedrock are anticipated, the structural and textural character of the rock as related to engineering requirements will be evaluated. Costs of excavation and disposal of excavated material will be estimated.

The lithology, physical characteristics and areal extent of the unconsolidated sediments overlying bedrock will be studied. A general lithologic description and distribution of the sediments in the basin will be compiled from existing reports published mainly by the USGS. At the specific sites selected for use, the surficial geology will be examined in more detail.

A surficial geologic map will be prepared for each site. The stratigraphy and thickness of the sediments, including depth to water table and thickness of saturated zone, will be determined. An isopach map (a map depicting thickness of sediments by use of contour lines) will be prepared. Other physical properties to be determined

include: sorting, size distribution, porosity, and permeability.

Field infiltration tests will be performed on site.

The topography and type and distribution of soils at the selected sites will be gathered from maps and observations made by the USGS and the Soil Conservation Service (SCS). The effectiveness of the particular combination of soil types and topography to renovate wastewater will be evaluated.

A general survey of specific areas will be made in order to determine the nature and quantity of existing surface erosion. This survey will pay special attention to hill slopes, river banks, and gulleys. Samples of water from streams and rivers will be analyzed to determine the amount and kind of both suspended and dissolved solids. Data of this kind will serve as a further indicator of the type and magnitude of surficial erosion in the area.

3.4 Hydrology

Hydrologic data for surface streams will be inventoried. The Merrimack River basin in Massachusetts will be subdivided into the drainage areas of the following rivers: Nashua, Sudbury-Assabet-Concord, Salmon-Stoney Brook, Shawsheen, and the main stem of the Merrimack below Lowell which includes the estuary. Quantitative discharge data for each of the above-mentioned drainage areas will include average, yearly and monthly discharge, mean annual flood, and flood frequency and low flow analyses. These data will be collected from USGS gaging stations located on the Nashua, Assabet, Sudbury, Concord, Shawsheen and Merrimack Rivers. If required, discharge data can be

reliably estimated for ungaged streams from analysis of regional area versus discharge relationships. Flow duration curves for the major streams will be prepared.

In conjunction with geologic studies of erosion, the quantity and location of instream deposits of sediment will be evaluated.

A general description of the regional occurrence of groundwater in the basin will be compiled from existing reports. A detailed study of groundwater occurrence will be performed at all areas chosen for possible land application of effluent. Observation wells will be sunk to levels below the water table at the select sites. Data compiled at these wells will be used to plot average depth to the water table and average thickness of the saturated zone. The elevation of the water table surface will be contoured and an estimate will be made of the groundwater flow direction. Long-term observations will supply data on seasonal variations in the water table elevation. Samples taken from the observation wells will be analyzed to determine a baseline level of water quality.

It is absolutely essential that land application of wastewater be managed. The wastewater itself and the groundwater with which it mixes must be closely monitored to control against contamination of local ground and surface water supplies. In order to achieve this control, the following procedures should be implemented. Test wells will be drilled and installed. Data gathered from the test wells will include the following hydrologic parameters: transmissibility; permeability; velocity of flow; specific yield; safe yield; calculation

of storage capabilities of the aquifers; calculation of recharge rates and if necessary, calculation of dewatering rates. Decisions concerning the type and spacing requirements for land application of effluent will be based in part upon the above data.

Proper groundwater management controls consisting of a network of wells and/or drainage tiles will be installed. The choice of which procedure to use will depend mostly upon the groundwater occurrence in the area and the type of land application systems. Water quality monitors will have to be installed so that at all times the quality of the water which will be allowed to recharge streams, go to reservoirs, or go back to the groundwater reservoir will be known.

3.5 Biota

Organisms composing aquatic or terrestrial communities are affected by the environment in which they live. Changing external and internal environmental factors which impinge upon the organisms, alter the organisms' environment. This can bring about fluctuations in the numbers of specific organisms within the community. The new conditions may also permit inhabitation or numerical increases of organisms previously not present or undetectable.

Planning wastewater management alternatives requires compilation of data and information describing existing aquatic and terrestrial ecosystems within the study area. Additional data enabling the planner to forecast environmental impacts resulting from alternative implementation must be collected from all sources both within and outside the study region.

Fresh Water and Marine (Estuary) Biota

Data and information defining existing aquatic environments of the Merrimack River, its tributaries and estuary, in terms of species composition, community stability, nutrient cycles and budgets and energy flow must be inventoried. Ions, molecules, compounds and/or organisms added to these communities from natural and man-made sources must also be determined and their impacts assessed.

Extensive sludge deposits have been reported on both the Merrimack and Nashua Rivers as a consequence of discharging untreated or partially treated wastewater over many years. It is paramount that information pertaining to the composition, decomposition, and constituents released from these sediments and the heterotrophic organisms inhabiting them be obtained. Where data is nonexistent, it must be generated so that impact of the sludge deposits on aquatic organisms can be assessed.

Current uses of the aquatic biota for recreational, economic, aesthetic and social purposes must be ascertained.

Terrestrial Biota

Wastewater management alternatives which utilize soil-biological systems to treat or further renovate wastewater or sludges require specific data and information pertaining to the intra- and inter-actions between the wastewater or sludge and various system components.

Data describing either agricultural or "natural" systems must enumerate important micro- and macro-botanical and zoological

species, transpiration rates, nutrient cycles and budgets, moisture requirements, growth season, crop productivity, and community stability. Existing information describing the tolerances and responses of organisms to increased moisture, or specific wastewater or sludge constituents, must be inventoried.

Abiotic parameters which directly or indirectly affect the biotic systems of the application site must also be described. Edaphic information for the study area should describe soil textures, cation exchange capacities, soil depths, infiltration and percolation rates, organic matter content, extent and location of specific soil types, depths to groundwater and the occurrence of impermeable layers within the solum. These parameters must be interpreted to assess the capacity of specific soil systems to adequately treat wastewater effluent or incorporate sludges.

Changes in climatic conditions previously described must also be considered as to their impact on the biotic community. This should include changes in precipitation, temperatures, relative humidity, and evaporation, resulting from implementing the wastewater management alternative.

Additional data pertaining to specific kinds and amounts of fertilizers, herbicides and pesticides used in the study area must be gathered. Areas and times of year in which these agricultural chemicals are used must be determined.

3.6 Demographic and Economic Activity

The prospect for future economic growth in any region is dependent on past trends and current conditions. Thus, past changes in the demographic and economic growth of the study area as compared to United States economic growth and the historical forces that have been influential in shaping the area's present day character will be discussed. The purpose of this section is to set the stage for section 4.1 in which the future economic growth of the study area is analyzed. Together, these sections will provide the necessary economic and demographic information essential for assessing the future demand for water and related land resource goods and services in the study area.

3.61 Indicators of Growth

Measurement of regional economic growth will concentrate on such traditional indicators as population, employment, income, and economic production. In addition, indicators more specific to the study will be developed where necessary. These indicators express in economic terms the need for water resource development.

Population

Especially important are the number of people now living and projected to live in an area as the need for water resource development is primarily related to this factor.

Personal Income

Provides an overall measure of regional economic growth.

Per Capita Income

Reflects the critical interplay between population growth and growth in total personal income.

Employment by Industry

Industrial output or activity at the national level is measured by gross national product. At the regional level, however, there are no official corresponding measures to the annual national output of goods and services. Therefore, employment data which is available in detail at the regional level is used to indicate changes in industrial activity.

Economic Production per Employee

Provide a basis for estimating indices of output for specified industries characterized by increasing automation or by an increasing ratio of capital to labor.

Earnings of Persons Engaged in Production

A major component of personal income which serves as a regional measure of output and recognizes labor's share in productivity gains.

3.62 Impacted Industries Studies

Those industries for which water is a direct production input and thus a location factor will be identified. Furthermore, environmental requirements associated with water and their corresponding impact upon those industries will be discussed.

Industries will be examined to resolve to what extent they must comply with new water quality legislation. This includes determining what capital expenditures are required by industries for

pollution abatement systems for compliance with the above legislation. These expenditures will produce certain burdens to the industries, and their impacts can then be deduced; i.e., can the industries contend with the financial implications and to what degree, or will these finances force industries out of business? Also, what is the effect on income, labor, industrial output, profits and taxes?

3.7 Inventory of Present Water Use and Waste Loads and Water Quality

An inventory of existing water use and its quality is an essential element for determining the needs of the future. The same holds true for waste loads, whether they be municipal, industrial, agricultural, storm, etc. Existing data is necessary in order to make accurate use and quality projections and respective treatment and distribution facilities.

3.71 Water Use Inventory

Consumptive and non-consumptive uses will be studied utilizing existing data and field surveys. Municipal and industrial water supplies, agricultural, recreational and storage uses, and water requirements for stream-flow maintenance for fish and wildlife, will be included. Community water sources will be verified, and per capita consumption figures will be determined for minor civil divisions, regional and basin areas.

3.72 Existing Water Quality Data

Existing river water quality will be examined at the New Hampshire - Massachusetts state line and at specific discharge

sites for both quantity and quality. Groundwater locations (local and regional) will also be analyzed for quantity and quality. Municipal and industrial point discharges will be examined for their chemical, physical and biological characteristics, as well as their projected future characteristics. Non-point discharges, such as agricultural related, soil erosion, oil handling, marina usage, highway runoff, and sanitary landfill seepage, will receive the same analysis. Storm water and combined sewerage overflows will further be examined. Instream sludge deposits will also be studied as they have direct influence upon stream quality.

3.8 Inventory of Present and Planned Water Quality Management Projects and Status

This inventory will include existing wastewater treatment facilities, facilities proposed or under construction under the current implementation schedule of the Division of Water Pollution Control, low flow augmentation projects, and instream treatment projects such as aeration, destratification, and oil pollution control barriers.

OUTLINE FOR SECTION 4.0

4.0 The Study Area Tomorrow

4.1 Projected Land Use Under Existing Policies and Trends

4.2 Projected Changes in Natural Systems

4.3 Future Demographic and Economic Activity

4.31 Indicators of Future Growth

4.4 Projection of Future Water Use, Waste Loads and Water Quality

4.0 The Study Area Tomorrow

This section will indicate what the state of the study area is most likely to be in the fifty year projection interval. The following subparagraphs describe the future area profile to be presented.

4.1 Projected Land Use Under Existing Policies and Trends

A profile of future land use will be prepared based on the latest land use planning and development trends. Strong consideration will be given to town zoning ordinances, state wetlands acts, conservation districts, master transportation plans, etc.

4.2 Projected Changes in Natural Systems

Modifications to characteristics of the land surface, both natural and man-made, will be examined.

4.3 Future Demographic and Economic Activity

The purpose of this task is to project the state of the study area economy over a fifty year interval. Data prepared by the Office of Business Economics, Department of Business Economics, Department of Commerce, and the Economic Research Service, Department of Agriculture will be examined to determine its usefulness in providing meaningful benchmark projections for the study area. These projections, referred to as "OBERS Projections," are conditional forecasts of the future based on extensions of past relationships believed to have future relevance for the measures being projected.

4.31 Indicators of Growth

In essence, both economic and demographic indicators

useful to water resources planning which were presented in section 3.31 will be extended for various benchmark years between 1970 and 2020. For water resources planning purposes, the assumptions underlying the projected indicators will yield what is essentially a "base line" projection. That is, no explicit account will be taken of the water resource endowments of the study area. The quantity and quality of available water will not necessarily be a factor in limiting future economic and population growth. Thus, it will be assumed that water will play the same role in stimulating or depressing economic growth in the region in the future as it has in the past.

4.4 Projection of Future Water Use, Waste Loads and Water Quality

Only after the past and present conditions of these factors are determined and the above parameters (4.1-4.31) have been projected for the future, can accurate projections be made with regard to water use, waste loads and water quality. Per capita water consumption figures and related quality requirements will be based upon municipal, industrial and agricultural water consumption projections. In turn, waste load volumes and related quality characteristics will be determined and will be a basis for treatment plant design. Stormwater runoff, sewer infiltration and specific waste source loads from marinas, dumps, oil handlers, farms, etc. must also be projected and be included as treatment plant design parameters.

OUTLINE FOR SECTION 5.0

5.0 Description of Wastewater Treatment Technologies

Septic Tank & Leaching Field Systems

Physical-Chemical Treatment

Primary Treatment

Secondary Treatment

Advanced Treatment

Facility Oriented

Land Oriented

Sludge Treatment

5.0 Description of Wastewater Treatment Technologies

Each of the technologies listed below and in the section 5.0 outline will be discussed describing the process and its components; as well as relative performance and reliability with regard to percent removals, land, chemical and power requirements, related costs, advantages and disadvantages of the processes, and their compatibility and combining effects with other processes.

Facility oriented advanced treatment processes include:

Activated Carbon Adsorption

Ammonia Stripping

Bio-Disc

Break-point Chlorination

Coagulation - Sedimentation

Electrodialysis

Filtration

Ion Exchange

Microstraining

Nitrification - Denitrification

Ozonization

Reverse Osmosis

Ultra-Violet Radiation

Land oriented advanced treatment processes include:

Spray Irrigation

Overland Flow

Rapid Infiltration

Sludge treatment processes include:

Digestion-Aerobic, Anaerobic

Thickening

Vacuum Filtration

Incineration and Pyrolysis

Sanitary Landfill

Composting

Sludge Drying Beds

Land Application

OUTLINE FOR SECTION 6.0

6.0 Industrial Profiles & Data

6.1 Inventory of Major Industries in the Massachusetts Portion
of the Merrimack Basin

6.2 Inhouse Treatment

6.3 Costs Involved

6.0 Industrial Profiles and Data

6.1 Inventory of Major Industries in the Massachusetts Portion of the Merrimack Basin

This task will compile and/or generate profiles of wastewater from major industries in the study area. Consideration will include a review of process water use, waste sources, and definition of the raw materials makeup, and the wastewater characteristics.

Industrial profiles will be outlined for the following industries:

<u>Industry</u>	<u>Waste Discharged</u>
Plastics	heated cooling water
Dairy	very high BOD
Cotton Textile	high BOD
Synthetic Textile	high BOD, resin binders
Food Processing	very high BOD, grease
Pulp & Paper	very high solids content, high BOD, newsprint, coloring & dirt
Metal Plating	acids, alkalies, chromate, other heavy metals and cyanide
Tannery	very high BOD, very high solids content, high chromium and sulfite
Wool Scouring	high BOD, grit grease, manure, detergents

6.2 Inhouse Treatment

For each major type of industry in the basin, this work item will address on-site full treatment of industrial wastewaters, as well as partial treatment before discharge to a municipal treatment system.

Included in this work item are investigations of specific industrial processes for inhouse waste segregation, water reuse, material recovery, recirculation of specific contaminants, reduction of wastewater volumes and substitution for toxic chemicals of those less toxic or non-toxic. Current industrial trends and alternate manufacturing processes designed to eliminate specific pollutants are to be considered.

Alternate schemes for ultimate disposal of solids are to be considered.

6.3 Costs Involved

Costs involved with inhouse waste segregation and water reuse should be balanced by money saved through product recovery and decreased water bills. Comparative cost analysis must be made for on-site pretreatment versus user fees to municipal wastewater treatment plants.

OUTLINE FOR SECTION 7.0

7.0 Description of Reuse and Multi-use Potentials of Wastewater and
Constituents

7.1 Use of Renovated Water

7.2 Uses for Specific Treatment Process Sludges

7.3 Multiple Use of System Components

7.0 Description of Reuse and Multi-use Potentials

Reuse opportunities will be identified on the basis of present and projected needs within the Merrimack basin. Multiple-use will be sought for every component of the wastewater system, including renovated water, sludge, brine, and generated gas; and the physical system including storage lagoons, land application sites and transmission rights of way. Even though resources may appear to be abundant, reuse may be encouraged in view of enhancing economics and minimizing wastage.

7.1 Use of Renovated Water

Water reuse will be identified for various components of the economy. Possible reuses include:

- Cooling Water
- Groundwater Recharge
- Industrial Process Water
- Irrigation
- Municipal Water Supply
- Prevention of Salt Water Intrusion
- Recreation
- River Flow Augmentation

Industrial uses constitute a major portion of the water supply needs within the Merrimack basin. Special consideration will be given to those industries that can use partially renovated wastewater and to compatible industries, for example, one industry utilizing the effluent of another industry.

In some areas of the basin, water supplies are dependent upon the supply of groundwater. There may be possibilities for recharging the groundwater in these areas.

Cooling waters are in large demand in specific portions of the basin. Many of these cooling demands could be met with lower quality waters than now used. There is a distinct possibility that using partially renovated water for cooling followed by irrigation may be a beneficial multiple reuse. Areas and amounts that could be utilized will be fully investigated.

Recreational needs in the Merrimack basin must be thoroughly investigated for needs which can be met by use of renovated wastewater. There has been some investigation in various parts of the country on creating recreational lakes, some for body contact recreation and some for non-body contact such as boating.

A thorough assessment of the anticipated needs for irrigation water will be made in terms of geographic areas and quantities.

Water supply for municipal use is a continual problem in many urban areas. Ways to reuse renovated water in the urban areas will be investigated, for example, separate piping for fire protection.

River flow augmentation holds possibilities for reuse in some areas of the basin. Coastal streams which have low flow at certain times of the year could benefit by additions of renovated water. Investigation will be made of present flows and desirable flows.

In some areas of coastal Massachusetts, salt water intrusion is becoming a problem. There has been considerable investigation and

success in forming a barrier to salt water intrusion by injecting renovated water along the coastline.

Other possible reuses will be investigated in as great a detail as those identified above.

7.2 Uses for Specific Treatment Process Sludges

Sludges from various treatment processes contain elements which can be used beneficially. In various parts of the country sludges have been utilized as a low analysis fertilizer, soil conditioner, and for renovating spoil banks and strip mines. Additional uses that will be examined in this study include uses of one process sludge in other processes, reclamation of metals and minerals from sludges and sludge as a source of energy.

7.3 Multiple Use of System Components

Examples of components of the physical system that can be used for more than one purpose are: storage lagoons to accept and beneficially use thermal discharges from power plants; land treatment sites for hunting and other compatible recreation; right-of-way for various types of trails; and utility routes.

8.0 Checklist of Land Use Guidelines

A summary outline which briefly describes available land use control methods used by all levels of government, both inside and outside of the study area, will be prepared. This outline will serve as a guide in developing land use controls for each wastewater management plan (see Section 11.2).

Each method will be described in terms of its past performance, facility of management, and relationship with water quality management.

Land use institutions at the local, state and Federal levels will be summarized as to their capability for implementing and/or enforcing land use policies. The role of each institution will be described with respect to legal, political, and traditional constraints which might affect the implementation process of the plan.

OUTLINE FOR SECTION 9.0

9.0 Checklist of Potential Impacts to Basin Areas

9.1 Economic

9.2 Social

9.3 Environmental

9.0 Checklist of Potential Impacts to Basin Areas

The purpose of this work item is to identify impacts, both positive and negative, that are potential outcomes from implementing wastewater management plans. The result will be a checklist of impacts categorized as economic, social or environmental.

These activities will differ from those of section 10.52 which will assess the significance of each impact generated by each proposed alternative plan.

Current methodologies for evaluating the potential impacts will be examined, i.e. methodology for determining impacts on land values.

9.1 Economic

Improvement in water quality in the Merrimack River and its tributaries should have significant economic consequences.

Industry should benefit from the improved water quality at some cost. The cost should be balanced by reclamation and recycling of reuseable materials from their wastewater, by an increase in the local tax base and land values as other industries are attracted to the revitalized riverfront and available water supply, and by a significant improvement in their community image.

Improved water quality should be a major impetus toward enhancing recreation and tourism. Swimming should be possible to a much greater extent and sport fish may once again be able to live and reproduce in many reaches of the rivers. The basin should be made more attractive by physical cleanup of the river, preservation of open areas, and multiple use of land application sites and trans-

mission rights of way as hiking routes and as pathways into forested areas.

Land values should be enhanced by the availability of a reliable clean water supply, improved recreation and employment opportunities and the implementation of thoughtful land use guidelines for community development.

9.2 Social

Economic benefits as discussed will have a direct bearing on social benefits. Improved individual economy increases allowances for leisure time activities. Available nearby employment and recreational areas should cut down on travel time, thereby allowing more leisure social time.

Visual improvement of the riverfront would lead to improvement of the cultural environment, i.e. riverfront concerts and social gatherings, attraction of artists to the area. Educational opportunities could be expanded to include more outside activities.

9.3 Environmental

Improved water quality in the rivers should enhance the productivity and diversity of the aquatic biota.

Land use guidelines protecting areas of open space and physical cleanup of the riverfront should have a favorable impact on terrestrial fauna and flora. Much of our wildlife thrives on the marginal edges between forest land and open space. Proper planning of transmission rights of way should enhance wildlife productivity and diversity by increasing areas of marginal edges. However, there may also be adverse aesthetic effects.

Proper management of spray irrigation of forest land encourages new, more accessible plant growth and should serve to enhance wildlife productivity. Possible adverse effects to public health will be examined.

OUTLINE FOR SECTION 10.0

10.0 Alternative Water Quality Management Analysis and Selection

- 10.1 Summary of Alternative Futures
- 10.2 Identify and Evaluate Wastewater Management Planning Areas
- 10.3 Establish Systems Design Criteria in Light of Technical Goals for Wastewater Management
- 10.4 Formulate Alternative Strategies for Point and Non-Point Sources
 - 10.41 Initial Formulation Phase
 - 10.42 Modification Phase
 - 10.43 Detailing Phase
 - 10.44 Develop Cost Sharing and Financial Arrangements
- 10.5 Evaluation and Selection of Final Water Quality Management Strategy and Plan
 - 10.51 Collect Information for Analysis
 - 10.52 Assess Beneficial and Detrimental Impacts of Alternative Plans:
 - Ecological
 - Aesthetic
 - Hygienic
 - Social
 - Economic
 - 10.53 Compare Performance of Alternative Plans
 - National Economic Development
 - Regional Development
 - Environmental Quality
 - Social Well-Being

10.54 Conclusions

10.6 Environmental Impact Statement

10.0 Alternative Water Quality Management Analysis and Selection

10.1 Summary of Alternative Futures

Population, economic and land use projections will be utilized to formulate various alternative wastewater management systems. Most methods for projecting population have been based on past trends. In many instances, this type of analysis has been recognized as being inadequate in reflecting the true trend. Generation of a series of population projections based on a combination of past trends with some sort of zero population growth will be the basis for economic and land use projections.

10.2 Identify and Evaluate Wastewater Management Planning Areas

The study team will identify wastewater management planning areas and will geographically, economically and socially examine the relationships between them.

10.3 Establish Systems Design Criteria in Light of Technical Goals for Wastewater Management

The study team will decide upon criteria for the technical design of the systems in terms of water quality necessary, as well as aesthetic, social, and ecological guidelines.

10.4 Formulate Alternative Strategies for Point and Non-Point Sources

10.41 Initial Formulation Phase

This task involves the formulation of basin and regional water quality management plans. Initially the study team will formulate a series of alternatives using advanced biological,

physical-chemical, and land application treatment methods for wastewater. Plans will be formulated utilizing each of these methods separately or in various combinations. Treatment of stormwater will be considered with various methods of control, and should be compatible with the other treatment systems for the point sources. A preliminary cost analysis will be made for each of these alternatives and initial evaluation will be done in terms of the ecological, hygienic, aesthetic, sociological and economic consequences.

The Congressional Resolutions authorizing this study require that the basin-wide wastewater management alternatives formulated must incorporate the plans developed by the Water Supply Pollution Control Commission of the State of New Hampshire. Thus, any basin-wide wastewater strategy must accept the New Hampshire plan as an integral part of the overall plan.

10.42 Modification Phase

In this phase, the previously developed alternatives will be modified and refined according to reuse of wastewater, multiple use of non-structural elements and regional variation. Some of the alternatives may be eliminated because of their incompatibility with regional goals and objectives as established in earlier phases of the study and during the public participation program.

10.43 Detailing Phase

The study team will strive to achieve systems which are cost effective, optimize reuse, meet the planning objectives to the greatest degree and have favorable reception. During this

phase, expertise of various disciplines and desires of the public will be incorporated into system designs which are implementable and meet the established criteria. At the conclusion of this phase, several alternative systems will be developed sufficiently to enable final system selection.

10.44 Develop Cost Sharing and Financial Arrangements

The study team will examine Federal, State and local cost sharing alternatives required to implement each detailed system. The question of user fees would be examined, e.g. the alternative of industry paying a cost-share for treating their waste in municipal plants.

10.5 Evaluation and Selection of Final Water Quality Management Strategy and Plan

Activities in this section will take place concurrently with those in Section 10.4. In the modification and detailing phases of the foregoing section, the evaluation must follow along to provide the basis for modification and detailing.

Selection of the final plan will be based on regional goals and objectives; reuse and multiple-use benefits; ecological, hygienic, aesthetic, social and economic impacts; effectiveness and efficiency. Selection will proceed according to the following Sections 10.51 - 10.53

10.51 Collect Information for Analysis

In this section, the study team brings together the data that has been developed in previous tasks into a form that is compatible with the evaluation analysis.

10.52 Assess Beneficial and Detrimental Impacts of
Alternative Plans

Ecological

Each wastewater treatment alternative proposed will impact upon the biotic and abiotic components of terrestrial and aquatic ecosystems. Through reduction in pollutant levels, each alternative will result in changes which will create new and presumably more stable biotic communities. It is important that each wastewater management alternative enhance the vitality and integrity of the system into which pollutants were previously discharged. A specific listing of impact areas within each of the general groupings listed below will be accomplished as part of the work activities of Section 9.0.

Climate

Geology

Hydrology

Biotic

Water Quality

Aesthetic

The wastewater treatment and disposal components, facilities, transmission lines, etc., of each alternative will have different impacts upon the aesthetic environment according to value judgments by each individual. However, accepted methods based on statistically recorded preferences will be used to evaluate aesthetic impact. Primary impacts will result from the direct changes in land or water surface.

Hygienic

Hygienic impacts will stem primarily from the utilization of renovated water and processed sludges in agriculture and for recreation and water supplies. Toxic, infectious, or irritating agents to human health will be addressed.

Social

Each regional wastewater management plan will cause physical changes, and in turn, alter associated human activities to varying degrees. The formal methodology for assessing the resultant social impacts has not been established because of the inability to quantitatively assess human experiences, needs, and values. However, an attempt will be made to evaluate social impacts from wastewater management plans.

Each plan will be evaluated for its influence on existing land use patterns, public utilities and services, and community and individual tax structures, on either a long or short term basis.

Economic

The criterion essential to the assessment of economic impacts is based upon whether the direct or indirect ecologic, hygienic, aesthetic, or social impacts imply net income changes to the nation, to the region, or to affected human activities or landowners. This criterion will be applied to each of the major forementioned impact areas to enable the specification of the geographical area having the greatest probable net income changes. In each

geographical area, assessment will be in terms of the use and the user of the resource. For each resource use, the nature of the net income change will be categorized as follows:

a. Cost of Using a Resource

These costs are expenditures made in order to use a polluted resource. For example, changes in water supply costs may result from reduction of toxicants or pathogens.

b. Cost of Using a Substitute or Alternate Resource

Costs must be evaluated where use of one resource may be foregone in favor of a substitute or alternate resource. For instance, desalination of ocean water or a distant reservoir may be utilized in place of renovated wastewater.

c. Cost of Revenue Foregone

Revenue will be foregone when a resource is not used. For example, if a beach is closed, revenues to the operator are lost. Where revenues are already being lost, the effect of a wastewater management plan may be to increase revenues. For example, if property values along a watercourse are depressed due to pollution, removal of the pollution will result in an increase in income to landowners and occupants.

10.53 Compare Performance of Alternative Plans

The study team will evaluate each wastewater management alternative for its performance and contribution towards achieving the goal of this study and the objectives set forth by the Water Resources Council in its "Principles and Standards," dated

21 December 1971. The Water Resources Council's objectives are to enhance:

1. National Economic Development - the impacts upon the nation's goods and services in terms of water supply, recreation, fish and wildlife, power, irrigation, etc.
2. Regional Development - the impacts upon regional employment, population distribution, economic base, individual income, improved community services and utilities.
3. Environmental Quality - the effect on the physical-biological system which sustains all life. Urban and rural areas of natural beauty and human enjoyment, such as open space, forest lands, lakes, rivers, streams, estuaries, marshlands, etc., must be given careful consideration during the planning process.
4. Social Well-Being - the impacts upon the security of life and health as affected by disease and the overall quality of life.

Each alternative must be evaluated to assure that it achieves the stated objectives of the study while minimizing adverse environmental, aesthetic, hygienic, social and economic impacts. In addition, the requirements of the Environmental Protection Agency state that the alternative be cost effective. The alternative must be a system which achieves the objectives at a greater differential between benefits and costs than other systems, i.e. the cost may be equal for both systems but one system may have greater benefits than the other one.

10.54 Conclusions

The study team will designate the alternative which best meets the basin goal and objectives. They will display the impacts and opportunities and the implementation problems of each alternative system retained at this stage, and make their recommendation to the decision makers.

The decision makers, namely the Corps of Engineers, the State Policy Committee and the Regional Policy Committee, must examine the recommendations of the study team and of the Technical Sub-Committee, information concerning all alternatives, desires of the regions as expressed by the Regional Planning Agencies, and information developed during public meetings. From this they must then make their selection and formulate their recommendations for the implementable plan.

10.6 Environmental Impact Statement

Section 102 (c) of the National Environmental Policy Act of 1969 requires the preparation of an Environmental Impact Statement and its filing with the President's Council on Environmental Quality. In order to comply with this law, and at the same time provide a full understanding of the environmental consequences of the recommended plan, an Environmental Impact Statement will be prepared.

Much of the information for the Environmental Impact Statement will be obtained from previous work items. Work will begin on the Environmental Impact Statement early in the study and continue until the conclusion of the study.

OUTLINE FOR SECTION 11.0

11.0 Administrative & Regulatory Systems for Implementation for
Basin and Regional Plans

- 11.1 Institutional Arrangements and Government Structure
- 11.2 Land Use Controls Required
- 11.3 Financial Arrangements for Construction
- 11.4 Needs for New Legislation Authority
- 11.5 Implementation Plans for Selected Basin, Regional and
Immediate Projects

11.0 Administrative and Regulatory Systems for Implementation for Basin and Regional Plans

11.1 Institutional Arrangements and Government Structure

An investigation and analysis of the existing institutional arrangements and governmental structure shall be made to determine changes, if any, required to implement and operate the wastewater management plans. An explanation of all recommended changes shall be provided in sufficient detail to allow proper evaluation. All levels of government shall be investigated and reported on in this section.

11.2 Land Use Controls Required

A determination will be made to see if present land use controls are adequate or if new ones are required to assure success of the regional and basin wastewater plans. If existing regulations are not considered adequate, recommendations for new regulations and permits and how they shall be executed shall be prepared.

11.3 Financial Arrangements for Construction

Financial arrangements for implementing the capital facilities of construction and the operations/maintenance aspects of the wastewater plans shall be reported on. All private and governmental sources of financing shall be investigated and presented as alternative sources of financing. The alternatives shall list borrowing conditions, etc. so that they can be evaluated. A sound recommended plan for financing the projects shall be submitted complete with detail in all aspects and must be sound.

This section shall also present the capabilities of the "public" to reimburse their share of the expenditures.

11.4 Needs for New Legislation Authority

For each alternative wastewater management plan, a review of existing legislation shall be accomplished and a determination made if revisions to existing and/or new legislation will be required. The suggested wording of the newly needed legislation and/or amendment shall be prepared and at what level of government they shall be instituted.

Any foreseen problems associated with the recommended legislation shall be enumerated and discussed.

Recommendations shall be made as to which legislation would be the most appropriate to use for implementing the plans.

11.5 Implementation Plans for Selected Basin, Regional and Immediate Projects

Implementation plans for each alternative shall be made for the basin, regional and immediate action projects. The implementation plan shall show in sufficient detail how the plans can be implemented from all aspects, i.e. institutional, financial, etc. It shall also include development of standard regulatory mechanisms which must be used as necessary to provide control, enforcement and operation of the plans.

OUTLINE FOR SECTION 12.0

12.0 Wastewater Treatment Systems Operation and Monitoring

12.1 Staffing Requirements, Training and Costs

12.2 Land Use Monitoring

12.3 Economic Monitoring

12.4 Population Monitoring

12.5 Water Quality Monitoring

12.0 Wastewater Treatment Systems Operation and Monitoring

12.1 Staffing Requirements, Training and Costs

a. Staffing

The staffing requirements to administer, operate and maintain the overall basin and regional wastewater management plans will be prepared. An organizational chart complete with description of positions, chain of command and number of positions required will be shown.

A listing of existing plants in the basin with assigned personnel will be compiled to determine the availability of personnel for the new systems; to see if some personnel could be transferred, given more responsibilities, or what additional training may be necessary.

b. Training

A recommended program for training personnel, especially in the field of advanced wastewater treatment, will be prepared. A synopsis of ongoing EPA and NE Interstate Water Pollution Control training programs will be made.

c. Costs

Operation and maintenance costs of collection, treatment, and distribution/reuse will be determined. Such costs should include personnel, estimated repairs, spare parts stockage, chemicals, tool replacement, etc.

A Table of Equipment with associated costs will be prepared to reflect office equipment, trucks, cranes, laboratory gear, etc., required for maintenance and operation activities.

Estimated costs for training personnel, retraining, training aids, etc., will be separately presented.

12.2 Land Use Monitoring

A program for Land Use Monitoring with respect to housing, industry, transportation, utility corridors, and natural characteristics based on approval and/or recommended land use development will be formulated. This effort continually would make surveillance on land use to assure that the land use proposals, upon which the wastewater management systems were based, were being carried out.

A reporting system will be prepared and recommendations on zoning and building violations will be considered. The necessity of land use revisions, etc., would be considered and how much revisions might affect the wastewater management plans.

12.3 Economic Monitoring

A program of monitoring economic development will be presented to show effective means of dealing with the activity. A listing of types of economic growth which would not overtax the wastewater management system will be made. Recommendations as to conducive economic growth and location will be formulated.

12.4 Population Monitoring

A program for monitoring population development shall be formulated to determine comparability with projected population data. This effort shall be accomplished on a regular schedule. Items such as changes in local residential densities shall be checked to determine if changes in the wastewater system are necessary.

12.5 Water Quality Monitoring

A program will be prepared for monitoring water quality, inspection of treatment facilities, etc. Provisions for keeping the program current and continuous shall be formulated. The monitoring will be carried out in a systematic and regular scheduled basis.

A sampling program by qualified laboratory personnel will be included on a regular basis.

OUTLINE FOR SECTION 13.0

13.0 Plan Report Completion and Updating

- 13.1 Plan Report for the Merrimack River Basin (Basin Plan)
- 13.2 Plan Report for Each Regional Planning Agency
- 13.3 Plan Report for Selected Projects of First Priority
- 13.4 Ancillary Documents
- 13.5 Plan Approvals
- 13.6 Draft Report Review Coordination
- 13.7 Procedures for Up-dating

13.0 Plan Report Completion and Updating

The basic function of a plan report is to transmit the study results to technically and non-technically oriented readers, who are not intimately familiar with the subject. This section establishes the format of the plan reports and ancillary documents for the Merrimack Wastewater Management Study.

Reporting requirements and procedures will correspond to guidelines within Federal and state Engineer Manuals, Engineer Regulations and Engineer Circulars applicable to Survey Scope Studies.

Each report will consist of a summary document and supporting appendices (Figure 2). Appendices will be written separately, providing for continual drafting and review as the study progresses. The only exception to this statement is the Comments Appendix which is designed to contain information received after the draft Survey Report is distributed. Conversely, the Background Information Appendix Draft can be completed early since it provides the necessary base information from which all plan formulation proceeds.

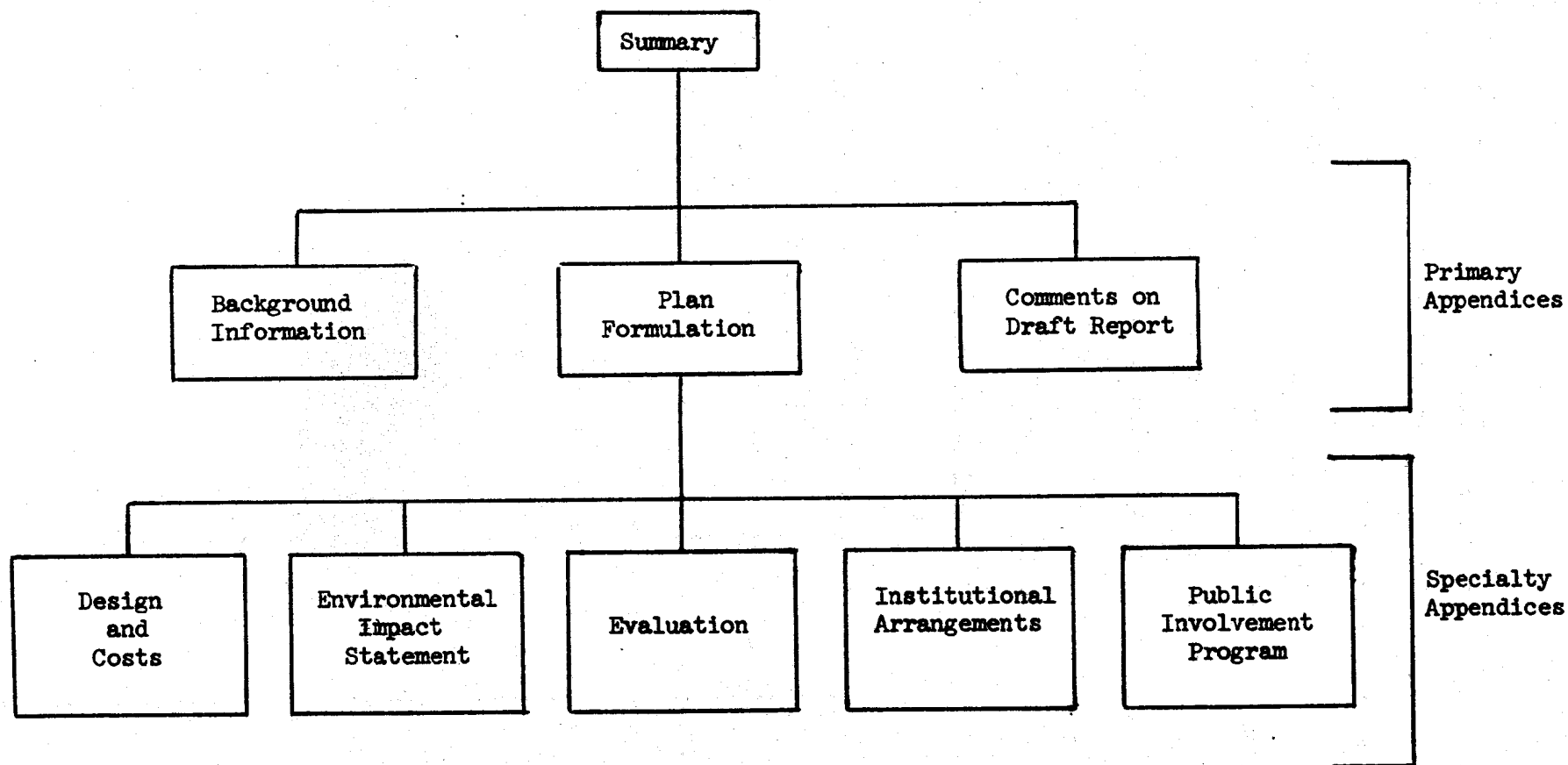
The report arrangement includes:

1. A well-illustrated summary for non-technical readers explaining how the study was conducted, the findings, and the final recommendations.

2. Primary appendices:

- a. Background Information - displays existing and future conditions, and identifies the specific needs and problems which solutions address.

FIGURE 2. TYPICAL REPORT ARRANGEMENT *



* For each report, namely: Basin Report
Regional Reports
Selected Project Report

b. Plan Formulation - documents the design, evaluation, and implementation arrangements; compares all alternatives; and displays the final plans.

c. Comments on Draft Report - documents the views of interested parties toward various proposed alternatives, following their review of the draft Survey Report.

3. Specialty appendices which contain the detailed information required to support the plan formulation process:

- a. Design and Cost
- b. Environmental Impact Statement
- c. Evaluation
- d. Institutional Arrangements
- e. Public Involvement Program

The plan reports will have as much detail as possible. As a minimum, technical objectives will be met, location and siting will be proposed, both resource requirements and reliability data will be displayed, and costs will be detailed enough so that selected components can be recommended for authorization.

Further, the plan reports will include display of the following:

1. Base condition, which includes the quality and quantity of the effluent currently being generated in addition to existing facilities.

2. Collection facilities required for each alternative, which includes costs and location of the pipe, cost and location of pumping stations, the capacity added, and the reliability of the system against spills.

3. Additions to the current treatment facilities, which include cost of each additional unit process and quality of the treated wastewater after each process. Resource requirements of each process, the additional capacity, and the total system reliability will be included.

4. New treatment facilities, which include the cost of each new facility broken down on a per unit process basis. The quality and quantity of treated wastewater and other by-products, resources required, facility reliability, and siting considerations will be included.

5. Additional transmission facilities which include costs, location of transmission routes, cost of pumping, and loading facilities, reliability of the system against spills, and volume handled.

6. Reuse facilities which include quality, quantity, and uniformity of by-products to be reused, processes necessary to reach the quality required and their associated costs, location of the reuse facilities, net economic returns, reliability of the reuse facility, and estimated longevity of demand.

7. Multiple-use opportunities which include joint siting of facilities and pipelines with other existing or proposed transportation networks such as highways or power transmission rights-of-way.

13.1 Plan Report for the Merrimack River Basin (Basin Plan)

a. Massachusetts

The Wastewater Management Plan for the Merrimack River basin will consist of an overall master plan for the portion of the

basin that is in Massachusetts. This will include those areas of the following Regional Planning Agencies:

Merrimack Valley Planning Commission

Northern Middlesex Area Commission

Metropolitan Area Planning Council

Montachusett Regional Planning Commission

Central Massachusetts Regional Planning Commission

Each Massachusetts municipality partially or totally within the topographic boundaries of the Merrimack River basin will be included in the Merrimack River basin master plan. Portions of the basin are within the Boston-Eastern Massachusetts Wastewater Management Study area (Plate 2) and will require close planning coordination. In these overlapping study regions, goals and objectives must be coordinated to ensure that compatible wastewater management plans are formulated.

b. New Hampshire

The wastewater management plan for the portion of the Merrimack River basin in New Hampshire is contained in the New Hampshire Water Supply and Pollution Control Commission report titled "Merrimack River Basin Plan" dated February 1972. Except for incorporating the New Hampshire Plan into the overall basin master plan, no further work or investigations shall be accomplished in New Hampshire.

13.2 Plan Report for Each Regional Planning Agency

The Regional Planning Agencies (RPA) are required by the Housing and Urban Development (HUD) to submit master water and sewer

plans for their respective regions. Each RPA plan report will cover the regional subjects outlined in the "Massachusetts Guidelines," pages 6-9 and 11-28, including environment assessment of plan proposals as specified by EPA regulations. Circular No. A-95 from the Executive Office of the President, Washington, D.C. requires the Corps of Engineers to be "consistent with or contribute to the fulfillment of comprehensive planning for the State, region, metropolitan area or locality." The forementioned overall basin wastewater management plan must be developed in such a manner that it can be divided into the specific areas comprising each RPA. (See Plate 2).

The regional plan reports will be published as separate volumes from the overall Merrimack River basin plan report. The regional plans will be prepared concurrently with the basin plan, and will provide more detail than the basin plan.

a. The regional plans for the Merrimack Valley Planning Commission will include all towns under its jurisdiction. This includes towns or portions of towns that are outside of the Merrimack River basin. The municipalities to be included in the regional plan report are:

Amesbury	Methuen
Andover*	Newbury*
Boxford*	Newburyport*
Georgetown*	North Andover*
Groveland*	Rowley*
Haverhill	Salisbury

Lawrence

West Newbury*

Merrimack

* Towns partially or completely outside the Merrimack River basin.

The Boston-Eastern Massachusetts Wastewater Management Study includes the town of Boxford in its planning area. That study's recommendations for Boxford shall be included within the Merrimack Valley Planning Commission regional plan report.

b. The regional plans for the Northern Middlesex Area Commission will include all towns under its jurisdiction. The Northern Middlesex Area Commission lies entirely within the Merrimack River basin. The municipalities to be included in the regional plan report are:

Billerica	Pepperell
Chelmsford	Tewksbury
Dracut	Tyngsborough
Dunstable	Westford
Lowell	

Billerica, Chelmsford, Tewksbury and Westford are also included in efforts of the Boston-Eastern Massachusetts Wastewater Management Study. The regional plans for these communities will incorporate and complement the Boston study's planning recommendations.

c. The Nashua River Program (NRP) under the auspices of New England Regional Commission will conduct a comprehensive study which will address wastewater management within the Nashua River basin.

Dunstable and Pepperell are included within their study area.

Regional plans including these two communities will encompass and complement the NRP planning recommendations.

d. Regional plans for the Montachusett Regional Planning Commission will include only those municipalities partially or totally within the Nashua River basin which is a sub-basin of the Merrimack basin. The towns to be included in the regional plan report are:

Ashburnham	Lunenburg
Ashby	Shirley
Fitchburg	Sterling
Gardner	Townsend
Lancaster	Westminster
Leominster	

Communities that are not assigned to Montachusett Regional Planning Commission but for the purposes of this study will be included in their regional plan report are:

Ayer
Clinton
Groton
Harvard

All of the communities included in the MRPC regional plans are within the planning area of the Nashua River Program. The regional plan report will include and complement the NRP planning recommendations.

e. The regional plan report for Central Massachusetts Regional Planning Commission will include the following communities that are partially or totally within the Merrimack River basin:

Berlin	Rutland
Boylston	Shrewsbury
Grafton	Upton
Holden	West Boylston
Northborough	Westborough
Paxton	Worcester
Princeton	

Berlin, Northborough, and Westborough are within the planning limits of the Boston-Eastern Massachusetts Wastewater Management Study. The CMRPC regional plan report will reflect the planning recommendations of that study. In addition, the CMRPC regional plan report will include the recommendations of the Nashua River Program for the towns of Boylston, Holden, Paxton, Princeton, Rutland and West Boylston.

f. The regional plans for the Metropolitan Area Planning Council will include the following communities:

Acton	Lincoln
Ashland	Littleton
Bedford	Lexington
Bolton	Marlborough
Boxborough	Maynard
Burlington	Natick
Carlisle	Sherborn

Concord	Southborough
Framingham	Stow
Hopkinton	Sudbury
Holliston	Wayland
Hudson	Wilmington
	Weston
	Woburn

The Boston-Eastern Massachusetts Wastewater Management study will include all of the forementioned communities within the Metropolitan Area Planning Council. The regional plan report for that area will encompass the planning efforts of the Boston study as well as any complementary recommendations by the Merrimack study.

It is noted that a portion of the town of Bolton lies in the Nashua River basin and will be included in the Nashua River Program study.

13.3 Plan Report for Selected Projects of First Priority

From the Merrimack Valley Planning Commission and/or the Northern Middlesex Area Commission regional plan(s), segments will be selected for more in-depth studies. Preliminary engineering plans shall be prepared on these selected priority projects.

The selected projects must be part of the overall regional plan, be self-sustaining, and be the proposed initial increment of construction for implementing the regional and basin plans.

The selected projects will be developed and recommended for authorization of further design and ultimate construction.

13.4 Ancillary Documents

Ancillary documents will accompany the completed reports when officially transmitted for approvals. These documents essentially fall into two categories depending upon their purpose and use. The categories are:

1. Documents prepared in the course of the study for use at public meetings, and transcripts of those meetings. All other pertinent documents regarding coordination and public involvement should be contained in the appendix entitled "Public Involvement Program."

2. Any document that requires coordination and review prior to study completion. At the present time, only the preliminary draft Environmental Impact Statement is included in this category.

An informative brochure will be prepared as a basis to public participation. It will be concise and creatively illustrated. The basin background, projected water needs and problems, and study objectives will all be briefly described. Technical means for satisfying these needs and objectives will also be described in the brochure.

The discussion of specific wastewater management alternatives for the Merrimack River basin will be reserved for the public meetings. Although the brochure will introduce the approach to these alternatives, it will not discuss them in individual detail. Each alternative retained for further investigation will be carefully explained, illustrated, and evaluated at the public meetings. The indication of the range of beneficial and detrimental effects of each alternative will also be verbally presented.

A preliminary draft Environmental Impact Statement will accompany the draft Survey Report when it is submitted to the Commonwealth of Massachusetts, Environmental Protection Agency, OCE, the Board of Engineers for Rivers and Harbors, and other Federal and non-Federal agencies for review.

13.5 Plan Approvals

The plans shall be prepared and forwarded for the review and approval of:

The Merrimack Technical Sub-Committee

The State Technical Committee

The State Policy Committee

Note: The approval of the public shall be accomplished by the Regional Planning Agencies.

The signatories of the report shall include:

Governor of Massachusetts

Each Regional Planning Commission

Environmental Protection Agency

Corps of Engineers

13.6 Draft Report Review Coordination

Engineer Regulation 1120-2-112, dated 1 July 1971, entitled "Coordination of Investigation and Reports with Clearing-houses" will be followed to insure that the potential impacts of the alternatives are recognized by all Federal and non-Federal agencies. A mailing list for the draft report will be furnished to OCE at least 30 days prior to expected distribution date. Review procedures for the Commonwealth of Massachusetts shall also be adhered to in processing the reports for approval.

OUTLINE FOR SECTION 14.0

14.0 Overall Program Management for the Wastewater Management Planning Program

- 14.1 Maintain Overall Program Management Procedures
- 14.2 Maintain the Developed Study Schedule with Appropriate Approved Revisions
- 14.3 Manage the Developed Cost System of Program Activities
- 14.4 Maintain Working Relationships between Agencies Accomplishing the Study
- 14.5 Manage and Evaluate Program Activities and Performance of Participating Agencies

14.0 Overall Program Management for the Wastewater Management Planning Program

14.1 Maintain Overall Program Management Procedures

The principal study effort shall be accomplished by the Merrimack Wastewater Study Team consisting of personnel from the following agencies:

Full-Time Basis

Corps of Engineers

Commonwealth of Massachusetts:

Office of State Planning & Management

Division of Water Pollution Control

Northern Middlesex Area Commission

Merrimack Valley Planning Commission

Part-Time Basis (on call)

Environmental Protection Agency

Commonwealth of Massachusetts:

Dept. of Commerce & Development

Dept. of Community Affairs

Dept. of Natural Resources

Dept. of Public Works

Central Massachusetts Regional Planning Commission

Metropolitan Area Planning Council

Montachusett Regional Planning Commission

Private consultants shall be utilized for study input as well as the members of the full or part-time staffs.

The following items must be addressed in the management of the study program:

Develop and maintain a system for overall schedule, cost and performance evaluation and control of the program.

Formulate and maintain a task schedule and cost plan for all agency activities in the study.

Supervise and evaluate the input from all agencies and staff sections.

Negotiate, administer and supervise all contracts with private consulting firms contributing to the study.

Manage and direct the study team efforts in data collection, determining system alternatives, assessment and evaluation of environmental aspects, institutional arrangements and public information and participation program.

Coordinate training of new study staff members.

Review capabilities of theoretical models, their application, and selection of models to be used.

14.2 Maintain the Developed Study Schedule with Appropriate Approved Revisions

The following items will be included in maintenance of the study schedule:

Maintain the established study schedule and include only approved revisions.

Notify proper study authorities as soon as possible of any problems affecting the schedule and their impact thereon.

Prepare and distribute project schedules to all interested agencies, noting critical and/or important features in the phasing of the study.

14.3 Manage the Developed Cost System of Program Activities

The following will be addressed in managing the cost system:

Maintain records of the study costs so that they are easily definable in such areas as labor, overhead, equipment, supplies, reproduction, etc.

Continuously review program costs to assure early notification of overruns, and the need for reassignment of funds for tasks as the study progresses.

Review costs and status of work with respect to private consultants and other agencies which provide study input under contracts, purchase orders, etc.

14.4 Maintain Working Relationships between Agencies Accomplishing the Study

The study team shall establish working relationships between all agencies, consultants and others who have a direct contribution to the study.

Regular monitoring conferences shall be held. All participating agencies, consultants and others will be invited for the purposes of briefing, requesting action or presenting study status. Whenever required, monitoring conferences may be called on short notice and at times other than the regular scheduled meetings.

Working relationship shall be maintained with personnel conducting studies in the Merrimack River basin or adjacent thereto which may affect the Merrimack study.

Coordination will be made with such agencies designated as observers on the organizational chart (Figure 1).

Extensive working relationship and coordination will have to be made with the Nashua River Program Study and the Boston-Eastern Massachusetts Wastewater Management Study.

14.5 Manage and Evaluate Program Activities and Performance of Participating Agencies

The planning and accomplishment of study input by participating agencies shall be developed, coordinated and monitored. Such agency work will be continuously reviewed during the course of the study for content, meeting of schedule, and applicability to the study.

Continuous evaluation of the study activities of agencies shall be made to assure that the material is accurate, useable and contributes appropriately to the study.

Participating agency activities shall be continuously reviewed with respect to the amount of work accomplished and the costs incurred.

JENNINGS RANDOLPH, W. VA., CHAIRMAN

EDMUND S. MUSKIE, MAINE
B. EVERETT JOHNSON, N.C.
CIRGH BAYH, IND.
JOSEPH W. MONTOYA, N. MEX.
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JOHN V. TUNNEY, CALIF.
LLOYD BENTSEN, TEX.

JOHN SHERIDAN COOPER, KY.
J. CALDER BOGGS, DEL.
HOWARD H. BAKER, JR., TENN.
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JAMES L. BUCKLEY, N.Y.
ROBERT T. STAFFORD, VT.
KARL E. MUNDT, S. DAK.

United States Senate

COMMITTEE ON PUBLIC WORKS

WASHINGTON, D.C. 20510

M. BARRY MEYER, CHIEF COUNSEL AND CHIEF CLERK
BAILEY GUARD, MINORITY CLERK

March 2, 1972

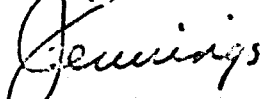
Chief of Engineers
Office, Chief of Engineers
Department of the Army
Washington, D. C.

Dear Sir:

Enclosed are original and four copies of a resolution adopted this date by the Committee on Public Works, requesting the Secretary of the Army, acting through the Chief of Engineers, prepare plans to meet the long-range water needs of the northeastern United States as authorized by Section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries within the Commonwealth of Massachusetts and the Boston Metropolitan area.

I am authorized and directed by the Committee on Public Works to transmit this resolution to you for appropriate action thereon.

Truly,



Jennings Randolph
Chairman

Enclosures (5)

ATTACHMENT NO. 1

United States Senate

COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE,

That the Secretary of the Army, acting through the Chief of Engineers, is hereby authorized, in connection with the preparation of plans to meet the long-range water needs of the northeastern United States as authorized by Section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries thereto within the Commonwealth of Massachusetts and the Boston Metropolitan area. The scope of such study shall be established with the consultation of the Commonwealth of Massachusetts and the Environmental Protection Agency and shall include measures for wastewater management including cleanup and restoration in the interest of water supply, environmental quality, recreation and fish and wildlife and shall incorporate the overall water resources and wastewater management implementation program previously determined by the Commonwealth of Massachusetts and approved by the Environmental Protection Agency. In order to avoid duplication of effort and expense, as well as to provide the orderly implementation of the studies and investigations authorized by this resolution, the Corps of Engineers is hereby directed to use the findings and recommendations of

United States Senate

COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

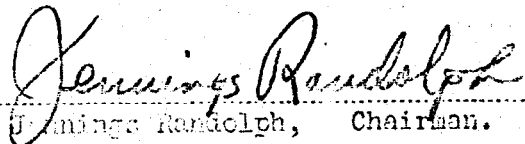
RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE,

(Continued)

the New Hampshire Water Supply and Pollution Control Commission as published in the Commission's report titled "Merrimack River Basin Plan," February, 1972, and any amendments thereto, as the sole basis for the Corps' recommendations relating to the New Hampshire portion of the Merrimack River basin.

Adopted: March 8, 1972

GPO 48-023-11


Jennings Randolph, Chairman.

(At the request of Senators Edward Brooke and Edward Kennedy of Massachusetts)

JOHN A. BLATNIK, MINN., CHAIRMAN

FORREST L. JONES, ALA.
JOHN C. KLUCZYNSKI, ILL.
JIM VRIGHT, TEX.
KENNETH J. GRAY, ILL.
FRANK W. CLARK, PA.
ED EDMONDSON, OKLA.
HAROLD T. JOHNSON, CALIF.
W. J. BRYAN BORN, S.C.
DAVID N. HENDERSON, N.C.
RAY ROBERTS, TEX.
JAMES KEE, W. VA.
JAMES J. HOWARD, N.J.
GLENN M. ANDERSON, CALIF.
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GEORGE W. COLLINS, ILL.
TENO RONCALIO, WYO.
NICK REGICH, ALASKA
MIKE MCCORMACK, WASH.
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JAMES V. STANTON, OHIO
BELLA ARZUG, N.Y.

WILLIAM H. HARGIS, OHIO
JAMES H. GROVER, JR., N.Y.
JAMES C. CLEVELAND, ILL.
DON H. CLARKSON, CALIF.
FRED SCHWINGEL, IOWA
M. G. (GOME) SNYDER, KY.
ROGER H. TION, IND.
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CHARLES E. MILLER, OHIO
WILMER D. MISELL, N.C.
JOHN H. TERRY, N.Y.
CHARLES TIGONE, NEBR.
LAMAR BAKER, TENN.

RICHARD J. SULLIVAN, CHIEF COUNSEL
LLOYD A. RIVARD, ENGINEER-CONSULTANT
LESTER EDULMAN, COUNSEL
CARL H. SCHWARTZ, JR., CONSULTANT—
PROJECTS AND PROGRAMS
CLIFTON W. ENSFIELD, MINORITY COUNSEL
JAMES L. OBERSTAR, ADMINISTRATOR

Committee on Public Works

Congress of the United States

House of Representatives

Room 2165, Rayburn House Office Building

Washington, D.C. 20515

TELEPHONE: AREA CODE 202, 225-4472

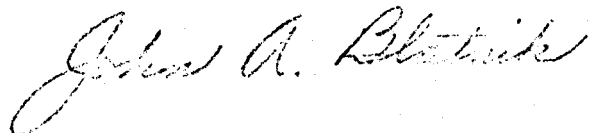
June 16, 1972

Chief of Engineers
Department of the Army
Washington, D. C. 20315

Dear Sir:

Enclosed is a resolution adopted by the
Committee on Public Works directing the Corps
of Engineers to proceed with a review investi-
gation of the Merrimack River Basin and Tribu-
taries within Commonwealth of Massachusetts and
Boston Metro. Area
(Docket #1869).

Sincerely yours,



John A. Blatnik, M. C.
Chairman
Committee on Public Works

COMMITTEE ON PUBLIC WORKS
HOUSE OF REPRESENTATIVES, U.S.
WASHINGTON, D.C. 20515

R E S O L U T I O N

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Secretary of the Army, acting through the Chief of Engineers, is hereby requested, in connection with the preparation of plans to meet the long-range water needs of the northeastern United States as authorized by section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries thereto within the Commonwealth of Massachusetts and the Boston metropolitan area. The scope of such study shall be established with the consultation of the Commonwealth of Massachusetts and the Environmental Protection Agency and shall include measures for wastewater management including cleanup and restoration in the interest of water supply, environmental quality, recreation, and fish and wildlife and shall incorporate the overall water resources

Adopted June 14, 1972

Attest: _____

John A. Blatnik, M. C.
Chairman

Requested by: Hon. Michael J. Harrington

and wastewater management implementation program previously determined by the Commonwealth of Massachusetts and approved by the Environmental Protection Agency. In order to avoid duplication of effort and expense, as well as to provide the orderly implementation of the studies and investigations authorized by this resolution, the Corps of Engineers is hereby directed to use the findings and recommendations of the New Hampshire Water Supply and Pollution Control Commission as published in the Commission's report titled "Merrimack River Basin Plan," February, 1972, and any amendments thereto, as the sole basis for the Corps' recommendations relating to the New Hampshire portion of the Merrimack River Basin.



CHARLES H. W. FOSTER
Secretary

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

18 Tremont Street

Boston, Massachusetts 02108

November 27, 1972

Major General R. H. Groves
Division Engineer
North Atlantic Division, Corps of Engineers
Department of the Army
90 Church Street
New York, N.Y. 10007

Dear General Groves:

Enclosed you will find a signed agreement between the Department of the Army, Corps of Engineers, and the Commonwealth of Massachusetts with respect to the Merrimack River Basin and the Boston Metropolitan Region.

I have been especially pleased with the cooperative working relationships which have been established between the Corps, the involved regional planning agencies, and various agencies of the Commonwealth. This joint effort should result in a waste water management plan of which we all can be proud.

You should note that the concluding paragraph of the agreement calling for an integrated planning effort will be the subject of an appendix document specifying the procedures to be followed. This will be forwarded to the appropriate office of the Corps as designated by you for signature. It should be regarded as an integral part of the agreement.

I am apologetic for the delay in completing our formal agreement, but the delay should not be construed as a lack of enthusiasm on the Commonwealth's part. The simultaneous planning programs relating to the Nashua, Southeastern New England, the Metropolitan District Commission, regional planning agencies, and the overall water quality planning project submitted to the Environmental Protection Agency made it essential that the total effort be coordinated at the outset. With the assistance of your office, this has now taken place.

Most sincerely yours,

A handwritten signature in cursive script, appearing to read "Charles H. W. Foster".

Charles H. W. Foster
Secretary

AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY,
CORPS OF ENGINEERS AND THE COMMONWEALTH OF MASSACHUSETTS

The Department of the Army, Corps of Engineers and the Commonwealth of Massachusetts agree to undertake jointly, a planning effort for wastewater management as specified herein, conditioned upon Congressional approval and appropriation of funds.

The Corps' portion of the effort will be conducted under the authority of its Northeastern United States Water Supply study, subject to qualification by subsequent Congressional resolution.

The study area will consist of the Massachusetts' portion of the Merrimack River basin, with expansion to the Boston Metropolitan area.

The wastewater plan will aim at thorough elimination of pollutants through the use of both basic and advanced treatment and disposal techniques and other approaches. The river basin planning requirements of the Federal Environmental Protection Agency and the definitely committed portions of the Commonwealth pollution abatement program will be basic to and incorporated in the development of this wastewater plan. The EPA requirements are specified in "Guidelines for Water Quality Management" as required by sections 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register, adopted 2 July 1970. The definitely committed portions of the Commonwealth program are taken to mean those pollution abatement facilities either under construction or listed in the now current implementation program of the commonwealth.

Major work items for plan development will be:

- a. An evaluation of the aim to achieve maximum water quality.
- b. An evaluation of institutional alternatives appropriate for implementing the wastewater plan.
- c. An evaluation of cost sharing alternatives appropriate to the wastewater plan.
- d. Formulation of a total wastewater management system for the study area.
- e. Detailed planning of a limited number of system projects.

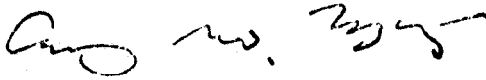
These will be projects in addition to those currently under design as part of the Commonwealth's implementation program.

Development of the wastewater plan will be broadly coordinated with the planning functions of other Federal, State and local agencies and groups operating within the study area, with particular reference to the New England River Basins Commission.

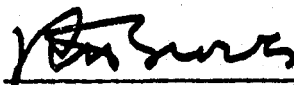
Public involvement in plan development will be sought through an open planning process. Guidelines for this process are contained in "Open Planning/The Merrimack," September 1971, a report prepared for the Corps of Engineers by the New England Natural Resources Center.

The planning effort will be conducted as a single operation, composed of both Federal and State personnel, having an integrated Federal-State decision process, and resulting in a joint report. A plan of study document describing the scope and specifics of the work to be undertaken will be prepared once the management decision process for the effort has been formulated. The wastewater planning effort will be completed in twelve to eighteen months after a plan of study is completed and accepted. The specific time schedule will depend upon the extent of Congressional directive, the amount of funds appropriated and the detailed scope of work.

For The Commonwealth of Massachusetts: For the Corps of Engineers:



Secretary
Executive Office of Environmental
Affairs



R. H. GROVES
Major General, USA
Division Engineer
North Atlantic Division

Date: November 27, 1972

Date: 18 July 1972

0.0 Formulation of Detailed Plan of Study

The detailed plan of study shall be written by the Corps of Engineers and the Commonwealth of Massachusetts.* It will incorporate items found in the work program developed by the Commonwealth as part of a state-wide water quality management study for EPA. It will also incorporate the ideas and recommendations of the Merrimack Technical Sub-Committee.

The detailed plan of study is an initial program development task; during which authority and responsibility will be delegated to the appropriate agencies for the development of the following series of inter-related work items:

1. Compile Existing Information and Data
2. Formulate Wastewater Management Alternatives
3. Evaluate Wastewater Management Alternatives
4. Refine Wastewater Management Alternatives
5. Develop Environmental Impact Statement
6. Select the Recommended Plan
7. Review and Transmit the Recommended Plan for further authorization.

*Herein and thereafter the Commonwealth of Massachusetts refers to the various agencies of the Commonwealth and the various Regional Planning agencies in the study area.

0.1 Summary of the Plan of Study

The Corps of Engineers, the Commonwealth's Office of State Planning and Management, and the Regional Planning Agencies will develop a summary of the Plan of Study. This summary will incorporate the ideas and recommendations of the Merrimack Technical Sub-Committee. It will also adhere to the guidelines set forth by EPA and HUD in January 1971, titled "Water Quality Management Planning Guidelines".

The completed summary of the Plan of Study will be distributed to the appropriate State and Federal agencies for review to ensure effective and efficient plan development. It will also be distributed to appropriate civic organizations and industrial and academic representatives to ensure citizen involvement in the planning process. It will also be reviewed by representatives of the technical sector to ensure adequate scientific involvement.

0.2 Guidelines and Criteria under which the Study will be Conducted

The guidelines for the study effort will be consistent with the previously stated philosophy and will determine the extent and scope of planning. The guidelines are based upon the following planning documents: Sections 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register adopted 2 July 1970, The Water Resources Council Proposed Principles and Standards for Planning Water and Related Land Resources (Part II), and the Federal Water Pollution Control Act Amendment of 1972.

The definition of the guidelines is offered with the intent of demonstrating how and under what principles this study effort will be conducted. It is hoped that these guidelines will provide a common ground for discussions concerning effective water-land use planning, as well as to delineate the Study Management Team's philosophy and methodology in determining and meeting the water related needs of the people of the Merrimack River basin.

0.3 Statement of the Problem

Before development of the detailed list and schedule of work items, there will be a review of the background of the study, and a definition of the area. This will include a description of the 1971 directives from the Congress of the United States and the President's Office of Management and Budget for a Pilot Wastewater Management Program and a brief review of the report that culminated this program. It will include the 1972 Congressional resolution instigating this survey scope study in the Massachusetts portion of the Merrimack River basin. The Merrimack River basin will be defined geographically and in terms of its present land use and water quality.

0.4 Organization, Management and Working Relationship between Agencies Accomplishing the Study

The Congressional Resolution authorizing this study's effort within the Massachusetts portion of the Merrimack River basin recognizes the need for a comprehensive, coordinated State-Federal plan which will incorporate the on-going efforts of the Commonwealth and the Environmental Protection Agency. The Corps will coordinate these efforts with the five Regional Planning Agencies lying partly or totally within the confines of the Merrimack River basin (Plate 2).

The organizational structure emphasizes close inter-disciplinary working relationships, and the detailed work program will formulate the process of organization and management concerning the agencies conducting the study. It will maintain a system for overall schedule, cost, and performance evaluation of the program.

Figure 1 illustrates the organizational chart for accomplishing the Merrimack River Basin Wastewater Management Study.

0.5 Evaluation of the Need for Models

This phase of the detailed work program will establish the types of models already available as well as those proposed for development. Models will be considered with respect to effectiveness, reliability, scope and cost.

Typical areas of model application are:

Storm and combined sewer overflows

Water quality stream classification

Land use planning

Compatibility of industrial waste & water requirements

with types of treatment facilities

Non-point source water pollution

Socio-economic inventories and projections

0.6 Develop and Detail Work Items

A major effort in the development of a detailed work program is the formulation of specific work items. It is imperative that these work items address all the alternatives concerning wastewater treatment and management. The items must include inventory of and compilation of all data that will be necessary to evaluate the alternatives. The work items will also address all tasks necessary to assess the social, economic, hygienic, aesthetic and environmental impact of the forementioned alternatives.

0.7 Estimate Division of Effort by Major Work Items

Efforts will be designated as major, minor, and consulting. Each work item will be evaluated in terms of the type of effort, if any, made by the Corps of Engineers, the Massachusetts' Division of Water Pollution Control, and the appropriate Regional Planning Agencies.

Efforts requiring outside expertise from private consultants will receive preliminary estimation. Although additional State and Federal agencies will be members of the Study Management Team, their contribution will be as needed, and an estimate of their work effort will not be designated in the Plan of Study, unless significant level of support is required.

See Annex Figure 1 for the designation of agencies to accomplish subject items.

0.8 Detail of the Cost of the Work Items

The cost of each work item will be detailed with respect to the degree of study importance related to that item, the phased implementation of considering that item, the information and expertise available for addressing the item, and the amount of available study funds.

See Annex Figure 3 for the designation of approximate funds allocated to agencies for accomplishment of the subject work items.

0.9 Develop Study Schedule

A schedule for the Merrimack Wastewater Management Study shall be jointly prepared and approved by the Commonwealth of Massachusetts and the Corps of Engineers.

The schedule shall list all items of work, their start-completion dates, and indicate critical points when such items are to be completed. The schedule must include in the overall work program for water quality management planning of the project such non-technical items as public meeting dates, and review and approval periods.

The schedule shall include an item for "Overall Work Program Development."

All events, including review and approval periods, shall be realistically be scheduled so as to reflect a schedule that can/maintained without serious revisions.

The project schedule shall not be altered without joint State-Corps approval. The schedule shall be reviewed on a regular basis to determine status of the project, adherence to scheduled events and if any changes are foreseen. The study manager shall advise the Merrimack Technical Subcommittee of any contemplated slippages in schedule as soon as possible.

See Annex Figure 2 for the designation of work program tasks schedule.

0.10 Develop a Public Involvement Program

A public involvement program will be designed to encourage the public to assist in the formulation and selection of alternative wastewater management plans.

Since the open planning process is an integral part of this study, the guidelines for initiating and conducting such a public communication program as presented in the New England Natural Resources Center's report "Open Planning/the Merrimack," dated September 1971, will be followed.

This report designates an open planning process which should stimulate substantial public involvement and participation in the Merrimack Wastewater Management Study. The Citizens Advisory Committee will assist community interests and act as an advisor/participant of the Study Management Team through the Regional Planning Agencies.

The Regional Planning Agencies will play a key role in the development of the public involvement program. They are the State-designated representatives of the citizens and civic organizations in their region.

0.11 Obtain Agreement by all Participating Agencies

The study shall be accomplished jointly by the Commonwealth of Massachusetts, Regional Planning Agencies within the basin, Corps of Engineers and in cooperation with the Environmental Protection Agency. A formal agreement will be signed by the Commonwealth of Massachusetts and the Corps of Engineers for conducting the study.

It is the intent of the study to arrive at a wastewater management plan for the Merrimack River basin, including its regional planning areas, which is acceptable to all concerned and which will be agreed upon.

The signatories for the report shall be the Commonwealth of Massachusetts, the Regional Planning Agencies, the Environmental Protection Agency, the New England River Basins Commission, and the Corps of Engineers.

The results of the report shall include the formulation of selected projects which will be forwarded for congressional authorization for further design and ultimate construction.